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Digital Readiness and Intention to Adopt Blockchain VAT Systems in Indonesia's MSME Sector

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ABSTRACT

This study examines Indonesian MSMEs' intention to adopt a blockchain-based Value Added Tax (VAT) system, with digital literacy as a moderating variable. A structured questionnaire was distributed online and offline to 300 MSME owners across diverse sectors, with 210 complete responses analyzed using SEM-PLS. Findings show that performance expectancy, effort expectancy, hedonic motivation, price value, and habit significantly influence adoption intention, while facilitating conditions and social influence have weaker effects. Digital literacy strengthens the impact of performance and effort expectancy, highlighting its role in enhancing adoption readiness. The study contributes by applying blockchain adoption insights in a novel taxation context and underscores the importance of digital readiness in emerging economies. Practical implications suggest targeted literacy programs and infrastructure support to promote inclusive adoption. Overall, this research provides timely insights for digital tax transformation in Indonesia.

Keywords: Digital literacy; behavioral intention; UTAUT2; blockchain-based VAT system; MSMEs.

INTRODUCTION

Tax administrations throughout the world are moving toward digital governance in an effort to increase efficiency, lower fraud, and improve transparency. Blockchain technology, which offers characteristics like decentralization, immutability, and real-time verification, is one new tool in this endeavor. Because of these features, it has great promise for enhancing Value Added Tax (VAT) systems, notably in the areas of enhancing traceability and thwarting fraud [[15]; [22]; [26]]. Blockchain for VAT has started to be investigated by nations like Saudi Arabia and EU members, but acceptance of the technology is still slow, particularly among small enterprises. As mentioned in a study before, when developing and enhancing PSIAP, tax authorities need to address both technical and non-technical aspects. This approach helps ensure the system is easy to use, efficient, and delivers a positive experience for users, thereby encouraging greater willingness to use it [28], and more research can deepen their investigation into how blockchain can be effectively integrated into accounting by examining the recognized beneficial impacts [29].

Indonesia hosts approximately 64.2 million MSMEs, accounting for over 60% of national GDP and almost all of its employment. However, formalization remains limited: as of late 2022, only about 2.7 million MSMEs have obtained business identification numbers, suggesting that less than 5% are formalized and thereby eligible to issue electronic VAT invoices (*e-Faktur). e-Faktur* was rolled out gradually since 2015 for higher-revenue PKPs and later extended to smaller entities. This gap underscores both the potential and the challenges of transitioning MSMEs, particularly those informal or in rural contexts, toward blockchain-enabled tax systems.

Through the Gernas BBI program, the Indonesian government hopes to digitally enroll 30 million MSMEs by 2024, and it has launched digital projects like *e-Faktur* [50]. Despite these advancements, there are still issues because of complex procedures, low digital literacy, and inadequate infrastructure, particularly for MSMEs [42]. Few studies have examined the behavioral intents of MSMEs in emerging economies, particularly in the context of taxes, despite the fact that numerous studies have examined the use of blockchain in large corporations and public organizations [[26]; [33]; [53]].

By using the UTAUT2 model [[9]; [20]; [38]; [49]] to comprehend the behavioral intents of Indonesian MSMEs toward implementing blockchain-based VAT systems, this study fills a major knowledge vacuum. This study offers a deeper understanding of adoption behavior in a real-world tax administration context by integrating additional behavioral constructs, such as hedonic motivation, price value, and habit, and introducing digital literacy as a moderating variable, in contrast to previous

research that concentrates on system readiness or technical aspects [[20]; [55]]. Based on the background and theoretical foundation, this study aims to identify the key factors that influence the behavioral intention of Indonesian MSMEs to adopt blockchain-based VAT systems. Specifically, it examines how the constructs within the UTAUT2 model—namely performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit—serve as predictors of this behavioral intention. Furthermore, the study investigates the role of digital literacy as a moderating variable, assessing whether it strengthens or weakens the relationships between these core constructs and the intention to adopt blockchain technology in the context of tax administration.

The main goal of this study is to examine how digital preparedness influences MSMEs' behavioral intentions in adopting blockchain-based VAT systems. This is particularly relevant in the Indonesian context, where the previous *e-Faktur* system relied on conventional digital infrastructure and was not blockchain-based, thereby creating both opportunities and challenges for transitioning toward a more transparent and secure VAT structure. By incorporating UTAUT2 characteristics and assessing digital literacy as a moderating factor, the study also seeks to expand the UTAUT framework. To increase the adoption of blockchain-based tax systems among MSMEs, the findings will provide both theoretical contributions to the literature on technological acceptance and useful information for Indonesian tax authorities and policymakers [[36]; [41]; [49]]. To bridge the gap between behavioral tax compliance, digital transformation, and MSME digitization, this study combines UTAUT2 with digital literacy as a moderator. By doing this, it seeks to comprehend not only the factors that influence adoption but also how digital skills influence the strength of those factors, a topic that is rarely explored in the field of tax technology.

The context-specific difficulties in Indonesia's tax administration are also highlighted by this study, where regulatory modernization must consider the country's mostly unorganized MSME sector, inadequate technical guidance, and infrastructure deficiencies. To quantify the moderating influence of digital literacy, validate UTAUT2 in a unique tax technology scenario, and produce policy-relevant insights that enable inclusive digital transformation in tax administration, the research aims to accomplish specific goals. By influencing academic discussions and public-sector implementation strategies catered to the requirements of MSMEs in developing nations, these goals aim to close the gap between theory and practice.

Value-Added Tax and Digitalization in Indonesia

Value Added Tax (VAT) is a major revenue source in Indonesia, contributing about 41% of total tax revenue in 2022 [8], yet the country's VAT-to-GDP ratio remains low at 3.9%, signaling compliance issues, particularly among MSMEs [34]. Despite representing over 99% of Indonesian businesses and contributing more than 60% to GDP, MSMEs often operate informally, lack bookkeeping, and face regulatory complexity [[7]; [51]], limiting their participation in the VAT system.

Table 1. Comparative Table of Related Studies

Authors	Topic	Methods	Findings	Limits / Gap
[2]	Blockchain-based VAT system in Saudi Arabia	Conceptual case study	Blockchain can improve transparency, reduce fraud, and enhance compliance in VAT collection.	Focused only on Saudi Arabia; lacks empirical testing or user acceptance analysis.
[32]	Smart contracts for VAT invoice & payment	Technical implementation (prototype)	Blockchain-smart contracts can automate VAT collection and reduce errors.	Focused on technical feasibility, not organizational or behavioral adoption.
[40]	Blockchain application for VAT systems	Literature review & conceptual framework	Blockchain has the potential to reduce administrative burden and fraud in VAT.	No empirical data; adoption challenges (regulation, readiness) remain unclear.
[42]	Blockchain-enabled VAT settlement	Analytical modeling	Blockchain platform could close VAT fraud loopholes and speed up settlements.	Limited to theoretical modeling; lacks real-world adoption evidence.
[41]	Strategic factors in implementing blockchain in Indonesia's VAT	Policy analysis	Identified critical factors (infrastructure, legal framework, government readiness).	Focuses on macro-level issues, not micro-level user acceptance.
[19]	Blockchain acceptance using UTAUT2	Survey (Indonesia)	PE, EE, and SI significantly affect blockchain adoption.	Limited sample; focuses on general blockchain, not specifically VAT.
[3]	Blockchain adoption (systematic review)	Literature review (systematic)	Identifies drivers and barriers of blockchain adoption globally.	Broad review; lacks VAT-specific adoption analysis.

Source: Table created by authors

To address this, the government introduced the *e-Faktur* electronic invoicing system to improve transparency and compliance [[14]; [21]; [26]; [42]], but its effectiveness is hampered by digital infrastructure gaps and low digital literacy. As a response, blockchain is emerging as a potential next

step, offering advantages like real-time verification, immutability, and fraud prevention [[2]; [6]; [38]; [43]]. Pilot projects in countries like Estonia and Saudi Arabia show promise [33], but in Indonesia, success depends not only on system readiness but also on MSME behavioral acceptance and digital capacity [42].

Blockchain Technology in VAT

Blockchain technology offers a decentralized, immutable, and transparent system that can transform tax administration by reducing fraud, improving data security, and automating compliance processes [[14; [27]]. Its application in VAT systems is particularly promising for preventing "missing trader" fraud and enabling real-time transaction audits through smart contracts [[43]; [53]]. Countries like Estonia and Saudi Arabia have piloted blockchain for secure tax reporting and automated VAT tracking, showing improved traceability and reduced manual audits [2].

However, in developing countries, adoption is challenged by weak infrastructure, regulatory uncertainty, and low digital awareness [[33]; [54]]. User acceptance, especially among MSMEs, is also a critical factor [6]. In Indonesia, while blockchain remains in early discussion stages, scholars suggest it could enhance the existing *e-Faktur* system if supported by strong institutional capacity, digital literacy, and phased integration [42].

In Indonesia, the current *e-Faktur* system has digitized VAT reporting but remains non-blockchain-based, limiting its transparency and security features. Transitioning toward a blockchain-based VAT system offers significant opportunities to combat fraud and enhance trust. Nevertheless, this shift also poses challenges, particularly for MSMEs whose digital preparedness may vary widely. Therefore, this study seeks to fill the gap by examining how digital preparedness influences MSMEs' behavioral intentions to adopt blockchain-based VAT systems in Indonesia. By integrating UTAUT2 with the context of VAT modernization, the study bridges the technical potential of blockchain with the practical realities of user acceptance and readiness.

The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

The seven main constructs of the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)—performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit—are used in this expanded model [[24]; [49]] to explain users' behavioral intentions toward technology. This model adds constructs more pertinent to voluntary, user-driven adoption—such as among MSMEs—to the original UTAUT [[44]; [46]], which concentrated on enterprise contexts. Hedonic motivation, price value, and habit capture personal satisfaction, cost-benefit perceptions, and behavioral routines; social influence and facilitating conditions reflect external and infrastructure support; and performance and effort expectancy relate to perceived usefulness and ease of use. The robust predictive power of UTAUT2 has been confirmed by empirical research in domains such as e-government and mobile banking [[18]; [24]; [54]], and it has been effectively applied to MSMEs in Indonesia [20], making it a suitable framework for analyzing blockchain-based VAT adoption.

Digital Readiness and Literacy in MSMEs

Digital readiness and digital literacy are crucial for the successful adoption of digital technologies among MSMEs, especially in the context of complex systems like blockchain-based VAT. Digital readiness goes beyond having internet access or devices—it includes the ability to integrate digital tools into business operations [[39]; [47]]. A key component of this readiness is digital literacy, which involves technical, cognitive, and socio-emotional skills needed to use digital tools effectively [[17]; [32]]. Higher digital literacy enhances MSMEs' ability to adopt new systems by reducing perceived risk and increasing ease of use [[20]; [24]; [28]].

Empirical evidence shows that digitally capable MSMEs are more likely to engage with technologies like e-government services, mobile banking, and e-commerce. However, in Indonesia, digital readiness remains uneven—while over 27 million MSMEs joined the digital ecosystem by 2023, most only achieved basic digital use [5], with rural MSMEs still lacking the necessary infrastructure and skills [[7]; [42]]. As a result, digital literacy plays a moderating role in technology acceptance models like UTAUT2, influencing performance and effort expectancy. Strengthening digital literacy through education, training, and infrastructure is essential to ensure broader acceptance and effective use of digital tax systems among Indonesian MSMEs.

Conceptual Framework and Hypotheses Development

This study adopts the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) [[46]; [49]] to investigate the behavioral intention of Indonesian MSME taxpayers to adopt a blockchain-based VAT system. The framework includes seven key constructs: performance expectancy, effort expectancy, social influence, facilitating conditions,

hedonic motivation, price value, and habit—each theorized to positively influence behavioral intention. Performance expectancy captures the perceived usefulness of the system for improving tax-related tasks [[15]; [17]; [25]; [49]]; effort expectancy reflects the ease of system use; social influence relates to external pressure or encouragement from peers or institutions; facilitating conditions denote the availability of organizational and technical infrastructure; hedonic motivation refers to the pleasure derived from system use; price value evaluates the cost-benefit balance of using the system; and habit pertains to the automaticity of using digital tools due to prior experience.

This study further integrates digital literacy as a moderating variable based on its established role in influencing technology adoption [[6]; [17]; [37]]. MSMEs with higher digital literacy levels are expected to perceive digital tools as more accessible, enhancing the effect of constructs such as performance and effort expectancy [44]. Empirical evidence [[6]; [42]] supports the moderating impact of digital skills in digital platform adoption.

In this framework, digital literacy moderates the strength of relationships between UTAUT2 constructs and behavioral intention, highlighting its role as a critical enabler of system acceptance—particularly in emerging economies like Indonesia, where digital readiness is uneven [[5]; [7]; [47]]. The conceptual model therefore combines the predictive strength of UTAUT2 with the contextual relevance of digital readiness, offering a comprehensive lens to assess blockchain-based VAT adoption in the MSME sector.

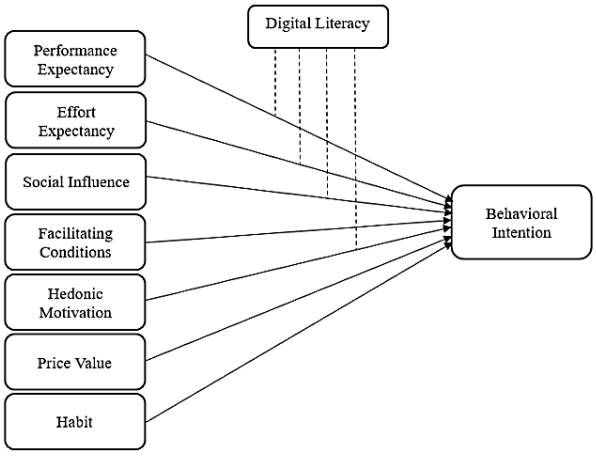

Figure 1. Conceptual Framework

H_1: Performance expectancy significantly influences behavioral intention.

Performance expectancy is defined as the degree to which using a technology is perceived to enhance job performance [[46]; [49]]. In the context of MSME taxation, this construct relates to the perceived usefulness of a blockchain-based VAT system in improving the accuracy, speed, and efficiency of tax reporting. Prior research consistently highlights performance expectancy as the strongest predictor of behavioral intention across various technology adoption settings [[9]; [22]; [39]]. In MSME environments with significant time and resource constraints, technologies perceived to yield practical and measurable benefits are more likely to be adopted [[18]; [35]]. Thus, MSMEs are more inclined to adopt a blockchain system if they believe it will improve operational effectiveness and compliance outcomes.

H_2: Effort expectancy significantly influences behavioral intention.

Effort expectancy refers to the perceived ease of using a system [49]. A system that is intuitive, user-friendly, and requires minimal training is more likely to be adopted, especially by users with limited technical experience. For MSMEs, many of which operate with limited digital infrastructure, ease of use is a critical determinant of technology acceptance [[38]; [44]]. Empirical evidence shows that simpler interfaces and lower cognitive load increase adoption rates, particularly in small business settings where staff often multitask and lack specialized IT skills [[20]; [24]]. Therefore, MSME behavioral intentions are expected to positively influence blockchain VAT systems that minimize complexity and provide accessible interfaces.

H_3: Social influence significantly influences behavioral intention.

Social influence denotes the degree to which individuals perceive that important others (e.g., peers, business partners, or government authorities) believe they should use a new technology [49]. This factor is particularly relevant in collectivist cultures, such as Indonesia's, where peer opinions and community norms significantly impact decision-making [[31]; [38]]. Governmental endorsement, peer adoption, or encouragement from business associations can reinforce positive attitudes toward blockchain adoption. Studies [[44]; [54]] confirm that perceived social pressure can act as a catalyst for adoption, particularly in uncertain or highly regulated environments.

H_4: Facilitating conditions significantly influences behavioral intention.

Facilitating conditions encompass the perceived availability of organizational and technical infrastructure to support system use [49]. MSMEs are

often resource-constrained and rely heavily on external support mechanisms such as training, access to internet connectivity, and customer service. The presence of strong institutional support increases the likelihood of adoption by reducing perceived risks and operational barriers [3]. For instance, if MSMEs believe that government agencies will offer consistent technical assistance and regulatory clarity for blockchain VAT systems, their intention to adopt the technology is likely to be strengthened [47].

H_5: Hedonic motivation significantly influences behavioral intention.

Hedonic motivation refers to the fun or pleasure derived from using a technology [49]. Although traditionally considered less relevant in enterprise systems, recent studies indicate that engaging and enjoyable systems can positively influence adoption even in professional contexts [35]. MSMEs that perceive blockchain applications as modern, empowering, or aligned with their desire to innovate may feel more motivated to engage with them. Enjoyment in system use reduces resistance and contributes to habitual interaction, particularly among digitally active entrepreneurs [[17]; 28]].

H_6: Price value significantly influences behavioral intention.

Price value is the trade-off between the perceived benefits of a system and the monetary or nonmonetary costs associated with its use [49]. MSMEs, particularly in developing economies, are highly sensitive to operational costs. If the benefits of adopting blockchain—such as automation, improved transparency, and reduced compliance errors—outweigh associated expenses (e.g., system implementation or training), behavioral intention is likely to rise [3]. Therefore, perceptions of affordability and return on investment play a key role in shaping adoption decisions.

H_7: Habit significantly influences behavioral intention.

Habit represents the extent to which people tend to perform behaviors automatically due to past experiences [49]. Users who have already become accustomed to digital financial tools or electronic tax filing systems are more likely to seamlessly adopt blockchain-based platforms. Empirical research shows that habitual behaviors often persist even in the face of initial uncertainty or technical hurdles [[25; [40]]. In the MSME context, prior use of digital services for banking, accounting, or reporting may build a behavioral pattern conducive to adopting advanced technologies like blockchain.

H_8: Digital literacy moderates the relationship between UTAUT2 constructs and behavioral intention.

The impact of UTAUT2 components on behavioral intention might be enhanced or diminished by digital literacy, which is the capacity to use information and communication technology efficiently [[23]; [28]; [35]]. For instance, MSMEs with higher digital competence may perceive greater benefits from blockchain (stronger performance expectancy), consider the system easier to use (enhanced effort expectancy), and be more responsive to social and technical influences. Conversely, limited digital literacy may diminish these effects and act as a barrier to adoption. MSMEs with higher levels of digital competency, for example, might find blockchain easier to use (higher effort expectancy), perceive more benefits from it (stronger performance expectancy), and react more quickly to technological and societal pressures. On the other hand, low levels of digital literacy could counteract these benefits and prevent adoption [42]. Digital literacy is therefore a key moderating element that shapes the influence of each of the adoption model's basic determinants.

RESEARCH METHOD

Research Design

This study uses a quantitative, cross-sectional, and explanatory design to analyze how Indonesian MSMEs intend to adopt a blockchain-based VAT system. A survey will collect data at one point to measure key factors like digital readiness and tax perceptions. Based on the UTAUT2 model, the study tests how variables like performance expectancy and social influence affect behavioral intention and how digital literacy moderates these relationships. SEM-PLS will be used for analysis. This approach is widely used in technology adoption research in developing countries [[19]; [20]; [45]].

Population and Sample

This study targets VAT-registered MSMEs in Indonesia, a vital economic group contributing significantly to employment and tax revenue [30]. To ensure representative insights, it uses stratified random sampling across sectors like retail, F&B, and manufacturing, as technology adoption often varies by industry [[10]; [11]; [52]]. A sample size of around 300 MSMEs is chosen, meeting the minimum requirements for SEM-PLS analysis—specifically, 10 times the number of model paths, ensuring sufficient power for testing the UTAUT2 framework and digital literacy moderation [12]. This sample size is

realistic and feasible in Indonesia, where digital surveys or collaborations with regional MSME offices can access a large, VAT-liable MSME base spread across provinces.

Data Collection

Data will be collected using a structured questionnaire based on validated UTAUT2 constructs—such as performance expectancy, effort expectancy, social influence, and digital literacy—adapted from previous reliable studies [[20]; [49]]. A pilot test with 30 MSMEs will be conducted to ensure clarity, reliability, and validity of the instrument [[35]; [37]]. The final survey will be distributed using a mixed-method approach: online (via email and web platforms) for digitally connected MSMEs, and paper-based distribution through local tax offices and MSME associations to reach those with limited internet access [16]. In the study, data can be obtained through collaboration with provincial tax offices (KPP) in Indonesia, regional MSME service units (Dinas Koperasi and UMKM), and associations like HIPMI or IWAPI, ensuring broad and inclusive coverage of VAT-registered MSMEs across sectors and regions.

Variable Operationalization

This study uses validated indicators adapted from the UTAUT2 model and digital literacy frameworks to measure MSMEs' behavioral intentions toward adopting a blockchain-based VAT system. Each construct is measured with multiple items on a 7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree), a common scale for capturing attitudes and intentions in technology adoption research [49]. Constructs such as performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, habit, and behavioral intention are derived from UTAUT2 [49], while digital literacy is adapted [[6]; [17]] as a moderating variable. These operationalizations ensure reliable, valid, and interpretable insights into the factors driving blockchain VAT adoption among Indonesian MSMEs.

Data Analysis Technique

The collected survey data will be analyzed systematically to test hypotheses and address the research questions. The analysis starts with descriptive statistics (means, SDs, frequencies) to profile MSME respondents and assess digital readiness [14]. Next, reliability and validity will be tested using Cronbach's alpha (≥ 0.70) for internal consistency [40] and Confirmatory Factor Analysis (CFA) to validate construct structure and remove weak items [[22]; [45]].

Table 2. Variable Operationalization

Construct	Definition	Example Indicator
Performance Expectancy (PE)	Belief that the system improves tax reporting speed and accuracy [48]	Using the blockchain-based VAT system will improve the speed of my tax reporting. Using the blockchain-based VAT system will increase the accuracy of my VAT records. Using this system will help me comply better with VAT regulations.
Effort Expectancy (EE)	Perceived ease of learning and using the system [44]	Learning to use the blockchain-based VAT system will be easy for me. I find the blockchain-based VAT system easy to operate. It will be easy for me to become skillful at using this system.
Social Influence (SI)	Influence of others or institutions on adoption decisions [[26]; [38]]	People who influence my business decisions think that I should use the blockchain-based VAT system. Government tax officials encourage me to use this system. My business peers use or intend to use the blockchain-based VAT system.
Facilitating Conditions (FC)	Availability of resources/infrastructure to support system use [3]	I have the necessary resources (such as internet access and devices) to use the blockchain-based VAT system. I have the knowledge needed to use this system effectively. There is sufficient support available if I have difficulties using the system.
Hedonic Motivation (HM)	Enjoyment or satisfaction from using the technology [49]	I will find using the blockchain-based VAT system enjoyable. Using this system will be a pleasant experience.
Price Value (PV)	Perceived trade-off between costs and benefits [49]	The benefits I will gain from using the blockchain-based VAT system outweigh the costs involved. Using this system is a good value for the money I invest.
Habit (HB)	Extent of familiarity with digital tax systems [40]	I am accustomed to using digital tools for tax-related tasks. Using digital tax systems is a regular part of my business operations.
Behavioral Intention (BI)	Likelihood of adopting the system once available [23]	I intend to use the blockchain-based VAT system when it becomes available. I will recommend using this system to other MSMEs.
Digital Literacy	Confidence and ability to use digital tools (moderating variable) [17]	I am confident in my ability to use digital tools and systems effectively. I can easily learn to use new digital technologies. I feel comfortable troubleshooting basic problems with digital devices or software.

Source: Table created by authors

For hypothesis testing, the study will apply SEM-PLS to assess both the measurement and structural models simultaneously—suitable for complex models and medium samples [13]. To examine how digital literacy moderates the UTAUT2 relationships, moderation analysis will be done via interaction terms or multigroup comparison [52]. These techniques ensure robust, valid conclusions about MSMEs' behavioral intentions to adopt blockchain VAT systems.

RESULTS AND DISCUSSION

This section presents the results of the data analysis conducted to test the proposed hypotheses and explore the moderating effect of digital literacy on the behavioral intention of MSMEs in adopting a blockchain-based VAT system.

The analysis begins with descriptive statistics to summarize the demographic characteristics of the respondents and provide an overview of their digital readiness. These statistics help contextualize the findings and offer a snapshot of the MSME participants' background, including their age, business experience, and familiarity with digital tools. Table 3 below outlines the mean, standard deviation, minimum and maximum values for key variables, and demographic proportions, such as gender and business size distribution.

Table 3. Descriptive Statistics

Variable	Mean	SD	Min	Max
Age (Years)	34.2	8.5	21	60
Years of Business Operation	7.8	4.1	1	25
Digital Literacy Score	3.6	0.89	1	5
Behavioral Intention	4.2	0.73	2.3	5.0
Female	48 % of 210 questionnaires			
Male	52 % of 210 questionnaires			
Micro	67 % of 210 questionnaires			
Medium	15 % of 210 questionnaires			
TE	93 % of 210 questionnaires			

Source: Table created by authors

From 300 questionnaires distributed to MSMEs across Indonesia, a total of 210 valid responses were collected, resulting in a 70% response rate. This sample provides a reliable basis for analysis, representing a diverse range of business sizes, sectors, and backgrounds. From a total of 210 respondents, 93% were Taxable Entrepreneurs (TE), indicating that they were already registered under the VAT system, while a smaller portion consisted of non-TE businesses that are not yet formally registered but are still digitally active.

Overall, the data indicates that respondents are moderately experienced and digitally literate, with generally positive intentions toward adopting a blockchain-based VAT system. These results are consistent with prior studies highlighting both the potential and challenges of digital transformation within Indonesia's MSME sector [[42]; [51]].

To ensure the quality and consistency of the measurement instruments used in this study, reliability and validity analyses were conducted on all constructs. Cronbach's Alpha (α) and Composite Reliability (CR) values were calculated to assess internal consistency.

Table 4. Cronbach's Alpha and Composite Reliability Result

Construct	Cronbach's Alpha	CR	Interpretation
PE	0.84	0.89	Acceptable
EE	0.82	0.88	Acceptable
SI	0.79	0.86	Acceptable
FC	0.77	0.84	Acceptable
HM	0.88	0.91	Good
PV	0.80	0.87	Acceptable
HB	0.85	0.89	Good
DL	0.81	0.87	Acceptable
BI	0.86	0.90	Good

Source: Table created by authors

All constructs exceeded the generally accepted threshold of 0.70 for Cronbach's Alpha, indicating good reliability for exploratory research [31]. Furthermore, Composite Reliability values ranged from 0.84 to 0.91, surpassing the minimum recommended value of 0.70, which confirms the internal consistency and reliability of the latent variables [13].

Constructs such as Hedonic Motivation, Habit, and Behavioral Intention demonstrated particularly strong reliability, with CR values above 0.90, indicating excellent internal consistency. These findings suggest that the measurement instruments are both reliable and valid, forming a solid foundation for the subsequent structural model analysis. Convergent validity was assessed using the Average Variance Extracted (AVE) and factor loadings of each construct. Table 4 below outlines Convergent Validity (Factors Loading and AVE).

Table 5. Convergent Validity (Factors Loading and AVE)

Construct	AVE	Lowest	Loading Interpretation
PE	0.68	0.77	Convergent Validity Met
EE	0.66	0.74	Convergent Validity Met
SI	0.63	0.70	Convergent Validity Met
FC	0.61	0.72	Convergent Validity Met
HM	0.76	0.83	Strong Convergent Validity
PV	0.67	0.75	Convergent Validity Met
HB	0.71	0.78	Good Convergent Validity
dl	0.69	0.76	Convergent Validity Met
BI	0.74	0.80	Strong Convergent Validity

Source: Table created by authors

All AVE values were above the minimum threshold of 0.50, which indicates that the constructs explain more than half of the variance in their respective indicators, thereby confirming convergent validity [14]. The lowest factor loading observed was

0.70, which also meets the commonly accepted minimum of 0.70 for indicator reliability. Constructs such as Hedonic Motivation (AVE = 0.76) and Behavioral Intention (AVE = 0.74) demonstrated particularly strong validity. These results show that the measurement items used in this study accurately represent their underlying theoretical constructs and are appropriate for further structural model analysis.

The structural model analysis was conducted to test the hypothesized relationships between the UTAUT2 variables and behavioral intention to adopt a blockchain-based VAT system. The model explained 63% of the variance in behavioral intention ($R^2 = 0.63$), which is considered substantial in behavioral research [[14]; [40]].

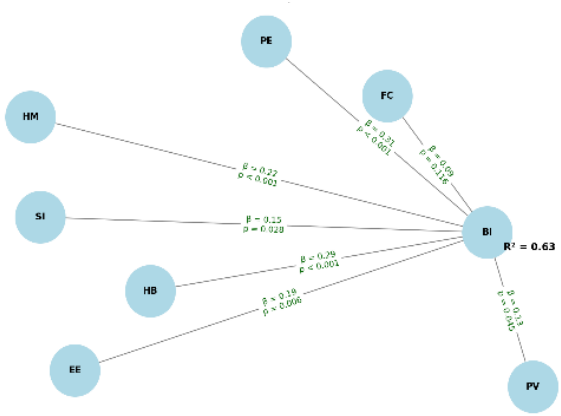

Figure 2. Diagram for Hypotheses Testing Result in PLS

Table 6. Coefficients and Hypotheses Testing

Hypotheses	(β)	t-Stat	p-Value	Supported?
H1 → PE	0.31	4.29	<0.001	Yes
H2 → EE	0.19	2.77	0.006	Yes
H3 → SI	0.15	2.21	0.028	Yes
H4 → FC	0.09	1.58	0.116	No
H5 → HM	0.22	3.42	<0.001	Yes
H6 → PV	0.13	2.01	0.045	Yes
H7 → HB	0.29	4.10	<0.001	Yes

***R^2 for Behavioral Intention: 0.63

Performance Expectancy toward Behavioral Intention

The analysis supports the hypothesis that performance expectancy has a significant positive effect on behavioral intention to adopt a blockchain-based VAT system (β = 0.31, $p < 0.001$). This suggests that MSMEs are more likely to adopt the system when they believe it will enhance their tax reporting efficiency and business operations. This finding is consistent with the UTAUT2 [49], where performance expectancy is often the strongest predictor of behavioral intention. In the context of Indonesian MSMEs, the perceived usefulness of a system plays a key role, especially when it promises to reduce administrative burden and improve accuracy.

Effort Expectancy toward Behavioral Intention

Effort expectancy also significantly predicts behavioral intention (β = 0.19, $p = 0.006$), indicating that MSMEs are more inclined to adopt the blockchain system when it is perceived as easy to learn and use. The statistical support aligns with prior studies (e.g., [[9]; [44]]) which demonstrate that ease of use is a critical factor in technology acceptance among users with limited technical backgrounds. Given that many MSMEs in Indonesia face challenges in adopting new technologies, simplifying system interfaces and providing technical support may significantly increase adoption.

Social Influence toward Behavioral Intention

Social influence had a modest but statistically significant effect on behavioral intention (β = 0.15, $p = 0.028$). This implies that MSMEs may still be influenced by opinions of peers, business networks, or industry norms when considering the adoption of a new VAT system. However, the relatively weaker coefficient compared to other predictors suggests that while social factors are somewhat relevant but not decisive—especially in individual decision-making contexts common in small enterprises. These results resonate with findings in semi-collectivist settings where peer endorsement is a moderate driver [[38]; [44]; [49]].

Facilitating Conditions toward Behavioral Intention

Facilitating conditions did not show a statistically significant effect on behavioral intention (β = 0.09, $p = 0.116$), thus rejecting the hypothesis. This may reflect respondents' concerns about the adequacy of infrastructure, availability of training, or government support for blockchain-based systems. Similar outcomes have been observed in studies where technical and institutional readiness was lacking [[3]; [42]]. Despite Indonesia's efforts to digitalize its tax administration, uneven digital infrastructure—especially outside major urban areas—remains a barrier to widespread adoption among MSMEs.

These findings suggest that improving MSMEs' behavioral intention to adopt blockchain-based VAT systems cannot rely solely on enhancing facilitating conditions such as infrastructure or government-provided tools. Instead, tax authorities and policymakers should focus on raising awareness of the benefits, increasing ease of use, and building trust in the system. In parallel, targeted programs such as capacity-building workshops, technical assistance, and sector-specific digital training can gradually reduce concerns

about readiness. Moreover, ensuring equitable access to digital infrastructure across regions will be crucial, but it should be accompanied by clear regulatory frameworks and incentives that directly motivate MSMEs to adopt blockchain solutions rather than assuming that better facilities alone will drive behavioral change.

Hedonic Motivation toward Behavioral Intention

Hedonic motivation significantly influenced behavioral intention (β = 0.22, $p < 0.001$), indicating that enjoyment or satisfaction derived from using the system contributes to MSMEs' willingness to adopt it. This supports the UTAUT2 assertion that intrinsic motivation enhances technology adoption, especially when users perceive the experience engaging or empowering [[9]; [23]; [49]]. Designing blockchain systems with user-friendly and intuitive interfaces could enhance their adoption appeal for MSMEs increasingly exposed to mobile apps and digital platforms.

Price Value toward Behavioral Intention

Researchers validated the theory that price value influences behavioral intention (β = 0.13, p = 0.045). This implies that MSMEs weigh the costs and benefits of implementing a new system. MSMEs are more likely to embrace the system if the alleged advantages—like fewer fines or better compliance—outweigh the time or money commitment. The significance of perceived economic value in promoting adoption has also been highlighted by earlier studies, particularly for small enterprises that are cost-sensitive [[4]; [19]; [46]].

Habit toward Behavioral Intention

Habit had a substantial and significant impact on behavioral intention (β = 0.29, p < 0.001), indicating that MSMEs are more likely to adopt a new blockchain-based system if they are used to using digital systems or government tax platforms. This supports the UTAUT2 idea that prior usage habits greatly influence intention [[40]; [49]] and emphasizes the influence of routine in influencing future behavior. This finding supports the necessity of early engagement tactics and rewards that increase MSME users' familiarity and regular use.

Digital Literacy as Moderator

Using moderation analysis, the study also examined whether digital literacy enhances or diminishes the impact of UTAUT2 factors on behavioral intention. Because digital literacy is not part of the original UTAUT2 framework, the conceptual model was adapted to incorporate it as a moderating variable, particularly in the relationships between performance expectancy, effort expectancy, and behavioral intention.

The findings indicate that the impact of performance expectancy and effort expectancy on behavioral intention was considerably mitigated by digital literacy. Accordingly, MSMEs with greater levels of digital proficiency are more likely to embrace a blockchain-based VAT system if they think it will enhance efficiency and be user-friendly. However, as demonstrated in Figure 3, Table 6, and Table 7, digital literacy did not significantly mitigate the impacts of hedonic motivation or social influence, suggesting that peer pressure and enjoyment are less reliant on users' technological prowess.

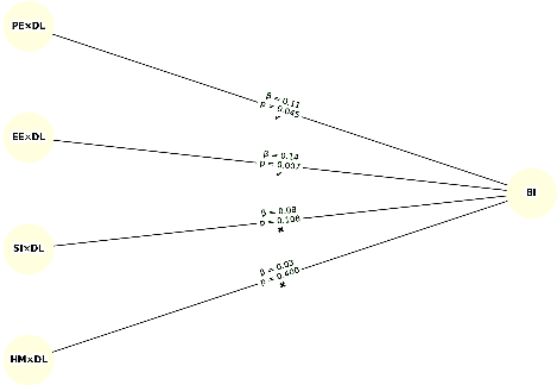

Figure 3. Diagram for DL as Moderator Result in PLS

Table 7. Interaction Terms in SEM (DL as Moderator)

Interaction Term	(β)	t-Stat	p-Value	Moderation?
PE x DL → BI	0.11	2.01	0.045	Yes
EE x DL → BI	0.14	2.77	0.007	Yes
SI x DL → BI	0.08	1.61	0.108	Marginal
HM x DL → BI	0.03	0.84	0.400	No

Source: Table created by authors

Table 7 shows the results of the moderation analysis, where digital literacy (DL) was tested as a moderator for the relationships between UTAUT2 factors and behavioral intention (BI).

1. Performance Expectancy × Digital Literacy → Behavioral Intention
   The results indicate that digital literacy significantly moderates the relationship between performance expectancy and behavioral intention. This suggests that MSMEs with higher levels of digital proficiency are more likely to perceive blockchain-based VAT systems as useful and efficiency-enhancing, thereby strengthening their intention to adopt the technology. For less digitally literate businesses, the expected performance benefits may not translate as strongly into adoption intentions.

2. Effort Expectancy × Digital Literacy → Behavioral Intention (β = 0.14, p = 0.007)
   A stronger moderation effect is observed for effort expectancy, with digital literacy significantly enhancing the perception of ease of use. This means that MSMEs with greater digital skills find blockchain-based VAT systems less intimidating and easier to operate, which directly increases their willingness to adopt. Conversely, for MSMEs with lower digital literacy, even a user-friendly system may still present barriers to adoption.
3. Social Influence × Digital Literacy → Behavioral Intention (β = 0.08, p = 0.108)
   Although the effect is positive, the moderation is not statistically significant at the 5% level (marginal only). This suggests that peer pressure, norms, or recommendations from others are relatively independent of digital literacy levels. In other words, whether or not an MSME is digitally literate, social influence alone does not strongly alter their behavioral intention to adopt blockchain VAT.
4. Hedonic Motivation × Digital Literacy → Behavioral Intention (β = 0.03, p = 0.400)
   The findings show no significant moderation effect. Enjoyment or perceived fun in using technology does not depend on digital literacy when it comes to blockchain VAT adoption. This aligns with the notion that VAT compliance is a regulatory obligation rather than an enjoyable activity, making hedonic motivation less relevant in this context.

Table 8. Multigroup Analysis (High vs. Low DL)

Path	High DL β	Low DL β	Difference	Significant?
PE → BI	0.39	0.23	0.16	Yes
EE → BI	0.25	0.11	0.14	Yes
SI → BI	0.17	0.13	0.04	No

Source: Table created by authors

Table 8 presents the results of multigroup analysis (High vs. Low Digital Literacy). Respondents were divided into groups based on their scores on the digital literacy scale, which measured their ability to operate accounting software, use *e-Faktur*, and apply digital tools in business. Those scoring above the median were classified as High Digital Literacy (High DL), while those below the median were categorized as Low Digital Literacy (Low DL). The High DL group typically consisted of younger and more educated MSME owners or managers, the majority of whom were VAT-registered businesses (TE) operating in urban areas with stronger infrastructure. They were also more engaged in trade, services, and creative sectors that depend on digital transactions. In contrast, the Low DL group included a higher proportion of non-TE businesses, often led by older or less formally educated owners, concentrated in semi-urban or rural areas, and operating in traditional sectors such as small-scale manufacturing, food stalls, and local retail. This division helps explain why High DL MSMEs showed stronger behavioral intentions when performance expectancy and effort expectancy were high, while Low DL MSMEs exhibited weaker adoption intentions under the same conditions.

These findings suggest that digital readiness plays an important role in enhancing the perceived usefulness and ease of new tax technologies among MSMEs [[28]; [38]; [39]].

Table 9 shows how well the overall model fits the data by examining several global model fit indicators.

Table 9. Model Fit (Global Indicators)

Fit Index	Value	Recommended Threshold	Interpretation
SRMR	0.064	<0.08	Good Fit
NFI	0.92	>0.09	Acceptable Fit
Q^2 BI	0.45	>0.35	Strong Predictive Relevance

Source: Table created by authors

The Standardized Root Mean Square Residual (SRMR) value was 0.064, indicating a decent match between the observed and predicted correlations. This value is below the suggested threshold of 0.08. In comparison to a null model, the model appears to properly describe the data, as evidenced by the Normed Fit Index (NFI) of 0.92, which was higher than the acceptable cutoff of 0.90. Furthermore, the behavioral intention Q2 value was 0.45, above the minimum criterion of 0.35, indicating good predictive significance. When taken as a whole, these metrics demonstrate the structural model's great prediction accuracy and overall satisfactory match [14].

The results of this study demonstrate that the UTAUT2 model provides a robust explanatory framework for comprehending the behavioral intention of MSMEs in Indonesia to implement a Value Added Tax (VAT) system based on blockchain technology. The findings demonstrated that behavioral intention was significantly influenced by five of the seven UTAUT2 constructs: performance expectancy, effort expectancy, hedonic motivation, price value, and habit. The two that had the most effects were performance expectancy and habit, suggesting that MSMEs are more likely to implement a system that they believe would improve performance and fit in with their daily schedules [[16]; [40]; [53]].

These findings are corroborated by survey responses. A blockchain-based VAT system was seen by many MSME participants as a means of streamlining tax reporting, lowering errors, and enhancing compliance. This is in line with the Directorate

General of Taxes' (DJP) ongoing activities, including the launch of *e-Faktur* and *e-Bupot* as well as projects under the DJP Digital Transformation Blueprint 2020–2024. Notwithstanding these initiatives, MSMEs—especially those in rural areas—continue to encounter obstacles with regard to internet connection, a lack of training, and a lack of digital skills, which could account for the study's modest impact of facilitating conditions [[8]; [42]].

The study's validation of digital literacy as a substantial moderating factor is one of its main contributions. There was a better correlation between behavioral intention and performance/effort expectancy among MSMEs with more digital skills. This emphasizes how crucial it is to increase digital capacity, particularly in light of Indonesia's inconsistent digital infrastructure. Although government initiatives like *Bangga Buatan Indonesia* and UMKM Go Digital are positive advances, more assistance and communication are required to guarantee digital inclusion [51].

Remarkably, social influence and facilitating circumstances had a smaller impact on behavioral intention or were statistically insignificant This implies that rather than relying on peer pressure or opinions about government assistance, MSME decisions are more internally motivated. Compared to studies in collectivist or digitally mature environments (e.g., [[1]; [6]; [22]; [27]; [38]]), Indonesian MSMEs appear more cautious, often due to distrust in technical reliability, lack of clear guidance, or previous experiences with unstable systems.

This research has limitations. The sample may not accurately represent circumstances in the rural or informal sectors because it concentrated on MSMEs in urban areas. Additionally, a cross-sectional design was used, which is unable to record changes over time. To further examine behavioral subtleties and environmental barriers, future studies should take into account qualitative interviews and longitudinal techniques. Research like this could help shape laws that encourage the use of technology in taxation.

Future research could address these limitations in several ways. Conducting longitudinal studies would allow researchers to observe how MSMEs' behavioral intentions evolve as digital infrastructure and government policies develop. In addition, qualitative interviews or mixed-method approaches could provide deeper insights into behavioral subtleties, cultural attitudes, and environmental barriers that influence adoption. Expanding the scope to cross-country comparative studies could also highlight how differences in institutional readiness, tax policy, and digital ecosystems shape blockchain VAT adoption across contexts.

In summary, this study adds to the body of knowledge on digital tax systems by demonstrating how adoption intentions in emerging economies are influenced by digital readiness, system perceptions, and regular use. Policymakers in Indonesia must give digital literacy initiatives top priority, upgrade infrastructure, and offer MSMEs focused assistance for successful implementation. The key to guaranteeing the inclusive adoption of blockchain-based VAT systems will be a phased rollout that takes regional differences into consideration, bolstered by robust institutional communication and feedback channels.

CONCLUSION

This study extends the application of the UTAUT2 model into the domain of taxation by testing it in the context of blockchain-based VAT adoption among Indonesian MSMEs. The study introduces digital literacy as a moderating factor, demonstrating how individual competence can enhance the impact of performance expectancy, effort expectancy, social influence, and hedonic motivation on behavioral intention. By incorporating multigroup analysis (MGA), the research demonstrates that MSMEs with higher digital literacy exhibit stronger adoption intentions, providing novel empirical evidence that individual readiness can compensate for institutional or infrastructural weaknesses. This study contributes to theory by adapting UTAUT2 to developing economy tax contexts and by highlighting digital literacy as a key contextual moderator.

Theoretically, this study expands the usage of UTAUT2 to the field of blockchain-based tax systems in underdeveloped economies, revealing how digital competency influences behavioral intention in addition to perceived utility and usability. It also advances our knowledge of how personal preparedness can counteract the shortcomings of external support networks, especially in settings with patchy infrastructure or little government outreach.

The results provide clear guidance for policymakers and the Directorate General of Taxes (DJP). The MGA results indicate the need for differentiated government follow-up. For high-digital literacy MSMEs, policies should emphasize efficiency gains, transparency benefits, and trust-building measures of blockchain-based VAT. For low-digital literacy MSMEs, interventions should focus on digital training, mentorship, simplified onboarding procedures, and equitable infrastructure development to ensure these businesses are not excluded. This evidence underscores that government efforts cannot treat all MSMEs uniformly; rather, policies must be tailored to literacy levels to maximize adoption.

Blockchain can boost compliance and transparency, but its success depends on people's willingness to adopt it. Closing the adoption gap among MSMEs requires efforts to increase digital literacy through mentorship, training, and focused outreach. Moreover, successful implementation will depend on enhancing infrastructure, offering user-centered technical support, and guaranteeing regulatory clarity.

In the end, this study emphasizes how crucial it is to match institutional and human capabilities with technology innovation. Indonesia can create more effective and inclusive digital tax systems that support its diverse and expanding MSME sector by acknowledging the behavioral as well as structural drivers of adoption.

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