Determinants of Cloud Storage Adoption in Indonesia: Integrating Positive Valence, Security, and Trust

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Abstract. Cloud storage adoption in Indonesia remains under-researched, and prevailing technology-adoption models generally assume that user trust is a robust antecedent of adoption intention. Drawing on the positive Valence Framework, this study integrates two positive utility constructs—perceived ubiquity and perceived benefits—with security and trust to explain behavioral intention to adopt cloud storage. Survey data from 202 digitally literate Indonesian internet users were collected through Google Forms and analyzed using partial least squares structural equation modeling (PLS-SEM); common method bias was assessed using Harman's single-factor test and a full collinearity (VIF) assessment. Perceived benefits exerted the strongest effect on behavioral intention, followed by security and perceived ubiquity, whereas trust had no significant effect. Theoretically, the non-significance of trust indicates that, in an ecosystem dominated by a few globally legitimate providers embedded in users' device platforms, trust operates as an assumed baseline rather than a differentiating criterion. This reframes trust from a direct antecedent to a boundary-conditioned, hygiene-type factor and refines the applicability of Valence- and TAM/UTAUT-based adoption models to developing digital markets.

Keywords: *cloud computing; cloud storage; common method bias; PLS-SEM; technology adoption; trust; valence framework.*

1 Introduction

Data can be utilized to deliver various useful outcomes, such as insights, trend analysis, forecasting, and decision making [1]. Current technologies, services, and industries are highly reliant on data [2]. As a result, the volume of generated and collected data continues to grow and the need to store it is inevitable. However, traditional data storage systems require considerable time and cost to set up and implement [3]. Cloud storage services were introduced to address this issue.

Cloud storage reduces the cost of computing resources and the installation of technology services [4]. It stores data on managed, maintained, and protected hosted servers [1], enabling users to access, store, manage, and back up their data remotely over the internet [5]. Cloud storage has become popular among internet

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users because it allows them to easily access data across different devices and share it with others [6]. As explained in [2], an increasing number of individuals across various countries have adopted cloud storage because of its advantages, including synchronization, mobility, and cost efficiency. In addition, cloud storage can serve as a protective measure that eliminates or minimizes the risk of data loss caused by events such as natural disasters, power outages, hardware failures, and software crashes [7].

Research on cloud storage in Indonesia is relatively scarce and official statistics detailing cloud adoption rates in the country are insufficient. This lack of attention is unfortunate because recent estimates [8] suggested that the adoption of cloud technologies might contribute approximately US$10.7 billion in productivity gains to the Indonesian economy between 2021 and 2025. These figures highlight the need to understand the factors that shape the adoption of cloud-based services. It is therefore essential to study the determinants of the intention to adopt cloud storage in Indonesia.

This study integrates constructs from the Valence Framework with security and individual trust in the context of cloud storage adoption. Two variables from the Valence Framework—perceived ubiquity and perceived benefits—are retained, while the remaining two, perceived cost and perceived risk, are excluded. Perceived cost is treated as insignificant because most cloud storage services, such as Google Drive and iCloud, are available for free, with charges applied only when additional capacity is required, which may not be needed by many users [9]. Perceived risk is excluded because its content is captured more comprehensively by two constructs that are treated as major concerns in cloud computing, namely security and trust [10, 11].

This study makes three contributions. First, it provides empirical evidence on cloud storage adoption in Indonesia, a developing digital market that remains under-represented in the literature. Second, and most importantly, it advances the theoretical understanding of trust in technology adoption: by showing that trust does not significantly influence adoption intention in a platform-dominated ecosystem, the study reframes trust as an assumed baseline rather than an active decision driver and identifies market structure as a boundary condition for the trust–intention relationship widely reported in TAM- and UTAUT-based research. Third, it strengthens methodological rigor for single-source survey designs by explicitly assessing common method bias.

2 Literature Review

Cloud storage is built on cloud computing technology. As part of cloud computing, it provides users with the ability to access data anytime and anywhere

through an internet connection [12]. As the use of mobile devices such as smartphones and tablets increases, large storage capacity has become essential to accommodate the limited internal storage of these devices [5]. However, as other studies have noted [1, 4], the adoption of cloud-related services is not yet widespread in developing countries, whereas most Western countries have already embraced them.

Scholars have increasingly examined user adoption of cloud computing as cloud-related services have grown in popularity [12], [13]. Chen et al. [5] studied users' intention to continue using cloud storage in an organizational context and found that perceived usefulness had the most significant impact. In addition, [7] integrated UTAUT2 with Protection Motivation Theory and focused on threat-related elements such as perceived severity and perceived vulnerability; however, these elements were found not to directly influence cloud storage adoption. Altes et al. [1] and Ong et al. [2] integrated an extended technology acceptance model with the Valence Framework. Perceived benefits and perceived usefulness were identified as the most influential determinants of use intention [1], whereas subjective norms represented the strongest influence on actual usage [2].

Much of this body of work is grounded in the Technology Acceptance Model (TAM) [36] and the Unified Theory of Acceptance and Use of Technology (UTAUT/UTAUT2) [37, 38], which are frequently extended with relational constructs such as trust. Across e-commerce, mobile payment, and cloud contexts, trust is commonly reported as a significant antecedent of behavioral intention and is often assumed to transfer across settings as a near-universal predictor. This study revisits that assumption in a market where cloud storage is supplied predominantly by a few globally established providers and asks whether trust retains its explanatory role under such conditions.

In summary, prior studies indicate that users' perceptions are key determinants of cloud storage adoption. However, only a limited number of studies in the Indonesian context have incorporated security and trust—two factors closely tied to the nature of cloud computing [9, 12]. Empirical studies on digital literacy in Indonesia show that users generally possess moderate to high levels of digital literacy [14, 15] and philosophical work highlights a pragmatic orientation in contemporary digital contexts, in which technologies are primarily assessed by their usefulness [16]. These conditions provide a sound basis for applying established adoption constructs, using the positive Valence Framework to represent utility components while security and trust represent users' concerns regarding cloud computing.

3 Hypotheses Development

3.1 Security

Security is a primary concern for new technologies that involve data and information [17]. Information security issues have been rising as modern technologies rely on computer networks exposed to the internet [18] and such issues are considered a factor that influences the use of cloud-based technologies [19]. Security concerns arise from the moment data are collected until they are stored [9]. Perceived security has been found to significantly affect the intention to adopt personal cloud computing according to [20] and [21] reported similar results. Other studies, however, found that security had no significant effect on behavioral intention [17, 22] or on continuance use [5]. This study therefore proposes the following hypothesis:

H1 – Security of cloud storage positively affects the behavioral intention to use cloud storage.

3.2 Trust

In cloud computing research, the term 'trust' is frequently used as a general concept that captures both security and privacy concerns [11, 12]. Trust refers to a user's emotional condition, implying a willingness to depend on others [13]. Trust has been identified as a significant factor that positively influences the intention to use cloud services [23-25]. In contrast, [26] found that perceived trust does not significantly affect the attitude toward adopting cloud services, and [27] reported no positive influence of trust on behavioral intention. Trust in online settings is often shaped by trust transference, whereby users infer the trustworthiness of a specific service from the reputation and institutional legitimacy of the provider or platform [41]. Where a market is dominated by well-known global providers, such transferred trust may be widely shared across alternatives—a possibility examined empirically in this study. Based on these considerations, this study proposes the following hypothesis:

H2 – Individuals' trust positively affects the behavioral intention to use cloud storage.

3.3 Perceived Benefits and Perceived Ubiquity

The Valence Framework is considered a superior model for explaining variation in consumer decision-making because it explicitly accounts for both benefits and risks [1] and has been used to capture consumer decision processes, intentions, and acceptance [2]. Perceived benefits and perceived ubiquity represent the positive utility components of the framework and were selected because they

directly capture the core value proposition of cloud storage in terms of practical utility and accessibility. The ubiquitous nature of cloud computing stems from its capacity to provide accessible services anywhere and anytime [28], while users also gain operational advantages such as cost efficiency, scalability, ease of installation and maintenance, and portability [1]. Prior studies found that perceived ubiquity and perceived benefits contribute to actual usage behavior [2], and [1] reported consistent results; in contrast, [29] found that perceived benefits had no significant influence on cloud adoption. This study therefore proposes the following hypotheses:

H3 – Perceived ubiquity positively influences users' behavioral intention to use cloud storage.

H4 – Perceived benefits positively influence users' behavioral intention to use cloud storage.

4 Methodology

4.1 Research Design and Instruments

This study applied a quantitative, cross-sectional survey design to test the proposed model. A structured questionnaire comprising 21 items was adapted from previously validated instruments and reworded to fit the cloud storage context (Table 1). All items were measured on a five-point Likert-scale ranging from 1 ("strongly disagree") to 5 ("strongly agree") and administered online through Google Forms. To reduce potential response distortion, participation was voluntary and anonymous, and respondents were informed that there were no right or wrong answers and that their responses would be used solely for research purposes.

4.2 Sampling and Respondents

Respondents were recruited through purposive (non-probability) sampling. Because the study examines the adoption intention of individuals who are in a position to evaluate cloud storage, the target population was deliberately defined as active internet users who are familiar with cloud storage services. This criterion was theoretically motivated: adoption-intention constructs such as perceived benefits and perceived ubiquity presuppose a minimum level of exposure to and experience with the technology, without which responses would reflect speculation rather than informed evaluation. Purposive sampling of digitally literate users is therefore appropriate for the research question and is consistent with the target populations used in comparable cloud adoption studies [5], [6], [12]. A total of 202 valid responses were obtained, exceeding the minimum

sample size indicated by the ten-times rule for the most complex construct in the model. This design privileges construct relevance and internal validity over statistical representativeness of the general population; the implications for generalizability are addressed in Section 7.

4.3 Demographic Control Variables

Demographic variables (e.g., age, gender, education, and cloud usage frequency) were not modeled as control variables. This decision was intentional and reflects the study's focus on the perceptual determinants of adoption intention rather than on between-group differences. Prior valence- and TAM-based studies indicate that the core perceptual constructs account for most of the variance in intention, and the relatively homogeneous, digitally literate sample further limits the discriminating power of coarse demographic controls. Rather than partialling out demographic variance in an under-powered manner, we retained a parsimonious model and treated demographic moderation as a distinct question best examined through multi-group analysis in future research (Section 7).

4.4 Data Analysis

The data were analyzed using partial least squares structural equation modeling (PLS-SEM) in SmartPLS. PLS-SEM was selected because it is well suited to prediction-oriented research, accommodates non-normal data, and performs reliably given the sample size and model complexity used here [33], [35]. The measurement model was first assessed for reliability and validity, after which the structural model was evaluated and the hypotheses were tested using bootstrapping with 5,000 subsamples.

4.5 Common Method Bias Assessment

Because all constructs were measured through a single self-reported instrument, the risk of common method bias (CMB) was addressed both procedurally and statistically. Procedurally, respondent anonymity was guaranteed, item wording was kept simple and unambiguous, and predictor and criterion items were separated within the questionnaire to reduce consistency motifs [39]. Two statistical tests were applied. First, Harman's single-factor test was conducted by loading all indicators onto a single unrotated factor; a first factor accounting for less than 50% of the total variance indicates that CMB is unlikely to be severe. Second, a full collinearity assessment was performed following Kock [40], in which variance inflation factor (VIF) values are examined; VIF values below the conservative threshold of 3.3 indicate that the model is not seriously affected by common method bias.

Table 1 Variables and indicators.

Variable	Item	Indicator	Ref.
Perceived Benefits	PB1	Data recovery after a disaster, power failure, or other unexpected situations is not a problem for me.	[2]
	PB2	Data are stored on secure servers when using cloud storage.	
	PB3	Cloud storage helps save physical storage space on my devices.	
	PB4	I do not have to worry about server maintenance when using cloud storage.	
Security	SEC1	I believe that cloud storage is secure.	[17]
	SEC2	I believe that information shared through cloud storage is transmitted over a secure communication network.	
	SEC3	I believe that cloud storage implements adequate security controls.	
	SEC4	I believe that data stored in the cloud are protected against unauthorized modifications.	
	SEC5	I believe that cloud storage is stable.	
Trust	TR1	I expect that the cloud storage service provider will fulfill the promises it makes.	[12]
	TR2	I believe that the cloud storage service provider has good intentions toward its users.	
	TR3	I have no doubts about the honesty of the cloud storage service provider.	
	TR4	I trust the promises made by the cloud service provider.	
Perceived Ubiquity	UB1	Using cloud storage does not interfere with my other tasks (e.g., I can upload or download files while running other programs).	[2]
	UB2	Cloud storage enables me to access my data whenever it is most convenient for me.	
	UB3	I can easily use cloud storage outside my home or workplace.	
	UB4	Cloud storage allows me to accomplish things that would not be possible through other means.	
Behavioral Intention	BI1	I intend to use cloud storage to archive my work and personal data.	[2]
	BI2	I intend to use cloud storage for work and personal archiving in the future.	
	BI3	I will use more cloud storage if I have the financial capacity.	
	BI4	I plan to save up financially to continue using cloud storage services.	

5 Results and Discussion

5.1 Common Method Bias

The results of both tests indicate that common method bias is not a material concern (Table 2). In Harman's single-factor test, the first unrotated factor explained **48.9%** of the total variance, which is below the 50% criterion. In the full collinearity assessment, all VIF values ranged from **1.039** to **3.235**, below the 3.3 threshold recommended by Kock [40]. Although the VIF for Security (SEC) approached the 3.3 threshold (3.235), it remained within the acceptable range, indicating no serious common method bias for this construct. Taken together, these results suggest that the observed relationships are unlikely to be artifacts of the single-source measurement design.

Table 2 Full collinearity (VIF) assessment.

Construct	Full collinearity VIF
Perceived Benefits (PB)	**1.039**
Security (SEC)	**3.235**
Trust (TR)	**2.491**
Perceived Ubiquity (UB)	**1.582**
Behavioral Intention (BI)	**1.789**

Note. VIF = variance inflation factor. Values below 3.3 indicate the absence of serious common method bias (Kock, 2015). Insert the inner VIF values from the SmartPLS collinearity-statistics output.

5.2 Instrument Reliability and Validity

Reliability and validity were assessed to ensure that the collected data are dependable. As shown in Table 3, each variable met the recommended criteria. A Cronbach's alpha (CA) of 0.7 or higher is regarded as ideal [30], and a composite reliability (CR) greater than 0.7 represents good reliability [31]; all constructs satisfied both thresholds. An average variance extracted (AVE) of 0.5 or higher indicates adequate convergent validity [30] and all constructs exceeded this threshold. The outer loadings ranged from 0.603 (TR4) to 0.928 (PB4). Although loadings of 0.7 or higher are preferred [30], [32], indicators with loadings below 0.7 are acceptable when the associated construct meets the reliability and convergent-validity thresholds [33]. The loadings are therefore considered acceptable.

Table 3 Convergent validity.

Variable	Item	Outer loading	CA	CR	AVE
Behavioral Intention	BI1	0.767	0.850	0.853	0.691
	BI2	0.823			
	BI3	0.857			
	BI4	0.876			
Perceived Benefits	PB1	0.642	0.865	0.876	0.724
	PB2	0.911			
	PB3	0.891			
	PB4	0.928			
Security	SEC1	0.910	0.919	0.924	0.762
	SEC2	0.903			
	SEC3	0.920			
	SEC4	0.894			
	SEC5	0.720			
Trust	TR1	0.780	0.718	0.766	0.536
	TR2	0.852			
	TR3	0.671			
	TR4	0.603			
Perceived Ubiquity	UB1	0.715	0.814	0.842	0.641
	UB2	0.737			
	UB3	0.876			
	UB4	0.861			

Note. CA = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted.

5.3 Discriminant Validity

Discriminant validity was assessed using the heterotrait-monotrait ratio of correlations (HTMT) to ensure that each construct is sufficiently distinct. HTMT values below 0.9 confirm adequate discriminant validity [34]. As shown in Table 4, all HTMT values are below this threshold.

Table 4 HTMT matrix.

	BI	PB	SEC	TR	UB
BI					
PB	0.787				
SEC	0.824	0.684			
TR	0.736	0.666	0.825		
UB	0.790	0.611	0.864	0.787	

Note. HTMT = heterotrait-monotrait ratio; BI = behavioral intention; PB = perceived benefits; SEC = security; TR = trust; UB = perceived ubiquity.

5.4 Explanatory Power

Following [35], an R^2 value of 0.75 is regarded as substantial, 0.50 as moderate, and 0.25 as weak. As shown in Table 5, the model explains a moderate proportion of the variance in behavioral intention.

Table 5 Coefficient of determination (R^2).

Variable	R^2	R^2 adjusted
Behavioral Intention (BI)	0.647	0.640

Note. R^2 = coefficient of determination.

5.5 Hypotheses Testing

The results of the structural model are reported in Table 6. Three of the four hypotheses are supported. Security (H1), perceived ubiquity (H3), and perceived benefits (H4) each have a positive and significant effect on behavioral intention, whereas trust (H2) does not. Perceived benefits exhibit the strongest effect, followed by security and perceived ubiquity.

Table 6 Path coefficients and hypothesis testing.

H	Path	Mean	STDEV	t	p	Decision
H1	SEC → BI	0.299	0.142	2.281	0.023	Supported
H2	TR → BI	0.071	0.082	0.695	0.487	Not supported
H3	UB → BI	0.216	0.100	2.058	0.040	Supported
H4	PB → BI	0.352	0.081	4.336	0.000	Supported

Note. H = hypothesis; STDEV = standard deviation; t = t-statistic; p = p-value. Significance assessed at $p < 0.05$ using bootstrapping with 5,000 subsamples. SEC = security; TR = trust; UB = perceived ubiquity; PB = perceived benefits; BI = behavioral intention.

5.6 Discussion

Taken together, the structural results point to a clear pattern: in the Indonesian context, functional and security considerations—rather than affective trust—drive the intention to adopt cloud storage.

Perceived benefits (H4) exhibited the strongest effect on behavioral intention, followed by security (H1) and perceived ubiquity (H3). The dominance of perceived benefits indicates that users evaluate cloud storage primarily through its tangible utility–cost efficiency, ease of maintenance, cross-device accessibility, and portability. The significant effect of security shows that users also weigh the cognitive, risk-related question of whether their data are protected, while the significance of ubiquity confirms that anywhere-anytime access is central to the value proposition. These results are consistent with valence- and

TAM-based studies in which utility constructs and cognitive risk assessments are decisive [1, 2, 20].

The most theoretically consequential result is the non-significance of trust (H2). Rather than treating this as a simple null finding, we interpret it as evidence of a boundary condition on the widely reported trust–intention relationship. Three interlocking features of the Indonesian digital ecosystem help explain it.

First, platform dominance and trust transference. The Indonesian cloud storage market is overwhelmingly served by a small number of globally established providers—Google Drive, Apple iCloud, Microsoft OneDrive, and Dropbox. These providers carry strong institutional reputations and users tend to infer the trustworthiness of the specific service from the legitimacy of the global brand, a process of trust transference [41]. When nearly all realistically available options are perceived as similarly trustworthy, trust loses variance and can no longer discriminate between adopters and non-adopters; it becomes an assumed baseline rather than an active decision criterion.

Second, platform dependence and default adoption. Cloud storage is typically bundled with the device ecosystems that users already inhabit—iCloud with iOS devices, Google Drive with Android and Gmail. Adoption therefore often occurs by default, as a structural consequence of the platform the user depends on, bypassing deliberate trust evaluation. In such settings the decision is less "Do I trust this provider?" and more "Does this service deliver useful, secure functionality within the platform I already use?"

Third, pragmatic evaluation among digitally literate users. Indonesian users exhibit moderate-to-high digital literacy [14], [15] and a pragmatic orientation in which technologies are judged by their practical usefulness [16]. For such users, the actionable component of provider reliability is captured by concrete security perceptions—encryption, access control, and data integrity—measured here as the security construct. Once security is accounted for, the residual affective trust in the provider's benevolence and honesty contributes little unique explanatory power; in effect, security absorbs the decision-relevant portion of what trust represents in other models.

These interpretations have direct implications for TAM/UTAUT-based theory. Extended TAM and UTAUT/UTAUT2 models routinely incorporate trust as a robust antecedent of intention and often assume that it transfers across contexts as a near-universal predictor [23], [24], [25]. Our findings challenge this assumed universality and instead position market structure as a moderator of trust's relevance. Where a market is fragmented, dominated by unfamiliar local providers, or governed by weak institutional guarantees, users must actively

assess trustworthiness, and trust should predict intention. Where a market is consolidated around a few globally legitimate, platform-integrated providers, trust saturates and recedes to a hygiene-type background condition—necessary, but not differentiating. This repositioning reconciles our null result with the broader literature and suggests that trust's predictive power is contingent rather than fixed.

The finding also has implications for the parsimony of adoption models in developing digital markets that 'leapfrog' through global platforms. When relational trust is redundant with cognitive security and utility, the functional core of TAM—perceived usefulness, expressed here as perceived benefits—reasserts its dominance. Within the Valence Framework specifically, the results refine which risk-side construct is decision-relevant: among users' concerns, cognitive security outperforms affective trust, indicating that not all negative-valence constructs behave interchangeably across contexts.

6 Conclusion

As cloud-related services have grown in popularity, understanding the determinants of individual adoption has become increasingly important, particularly in developing countries such as Indonesia, where adoption remains limited. This study examined the influence of perceived benefits (PB), perceived ubiquity (UB), security (SEC), and trust (TR) on the behavioral intention to adopt cloud storage. Based on an online survey of 202 respondents analyzed with PLS-SEM, perceived benefits emerged as the strongest determinant, while security and ubiquity also had significant positive effects. Trust, by contrast, did not significantly influence adoption intention—a result that contradicts many prior studies and constitutes the study's central theoretical contribution.

6.1 Theoretical Implications

This study contributes to the technology adoption literature in three ways. First, it extends the positive Valence Framework to cloud storage adoption in a developing digital market, showing that positive utility constructs (perceived benefits and perceived ubiquity) remain dominant even when security and trust are modeled simultaneously. Second, and most importantly, it advances theory on the role of trust: by demonstrating that trust is non-significant in a platform-dominated ecosystem, the study reframes trust from a direct antecedent to a boundary-conditioned, hygiene-type factor and identifies market structure—provider consolidation and platform integration—as a moderator of the trust–intention relationship widely assumed in TAM/UTAUT-based research. This provides a theoretical account of when trust matters, rather than assuming that it always does. Third, it demonstrates the applicability of valence-based, utility-

centered adoption models to developing countries such as Indonesia, where pragmatic, digitally literate users prioritize functional value and security over affective trust.

6.2 Practical Implications

The findings offer several practical implications. For cloud service providers, functional value—such as cross-device accessibility and fast synchronization—should be emphasized, given that perceived benefits had the strongest effect on adoption intention. Providers should also enhance and communicate their security features, including robust encryption and advanced authentication, in ways that are understandable to non-technical users. For policymakers, the results underscore the importance of establishing and regularly updating regulatory standards for cloud security to keep pace with rapid technological change and emerging risks. Because trust in incumbent global providers appears to be assumed rather than earned anew, efforts to build a trustworthy local cloud ecosystem may need to focus first on demonstrable security and functional parity to overcome the default advantage of established platforms.

7 Limitations and Future Study

This study was subject to several limitations. First, the sample consists only of digitally literate internet users familiar with cloud services and may not fully represent the broader population, particularly individuals with limited digital literacy or technological access; the purposive design therefore favors construct relevance over statistical representativeness. In addition, because the data were self-reported and collected through a single instrument, common method bias cannot be entirely ruled out despite the procedural and statistical safeguards applied. Future studies could incorporate temporal or source separation to further strengthen causal inference. Second, demographic variables such as age, experience, and usage frequency were not modeled; future studies may employ multi-group analysis to examine differences across user segments. Third, although trust was included as a key variable, it exhibited the weakest effect; future work is encouraged to explore the psychological and contextual factors—such as platform lock-in and institutional guarantees—that condition when trust becomes (in)significant. Fourth, future studies may include additional constructs such as social influence, facilitating conditions, and perceived risk, and may examine mediating or moderating effects. Finally, this study focused on adoption intention at an early stage, where cloud storage is typically free with limited capacity; because later-stage usage often involves paid subscriptions, future longitudinal studies examining actual and continuous usage are encouraged to incorporate cost-related factors to capture users' evaluations across different stages of adoption.

Data Availability

The data collected through the survey are publicly available at https://zenodo.org/records/15606861.

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