

## Linking Technology Readiness and Service Utilization: A TRI Study of SMEs in Java, Indonesia

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### Abstract

Micro, Small, and Medium Enterprises (SMEs) in Java Island represent a strategic sector contributing significantly to Indonesia's economy. However, many SMEs face challenges in adopting integrated technologies, limiting their ability to compete and grow in the digital era. One key issue is the lack of understanding of their technological readiness and the absence of a standardized model to evaluate technology adoption comprehensively. This study addresses this gap by developing a model to measure the Technology Readiness Index (TRI) of SMEs, serving as a foundation for strategies aimed at improving digital adoption. The model builds upon the Technology Readiness Index (TRI) by Parasuraman, focusing on psychological dimensions such as optimism, innovativeness, discomfort, and insecurity. The study adopts a quantitative approach through a year-long survey involving SMEs from various sectors across Java. Data was collected using TRI-based questionnaires and analyzed using regression techniques to explore the relationship between readiness and actual technology use. The findings indicate a significant and positive relationship between SMEs' technology readiness and their use of technology-based services. In other words, SMEs that demonstrate higher levels of readiness tend to adopt technology more actively. Although technology readiness is not the sole factor, it plays an important role in influencing adoption behavior. These results highlight the importance of tailored interventions that align with SMEs' readiness index to support their digital transformation journey. The study recommends using the TRI model as a diagnostic tool to design effective support policies for SMEs in developing countries.

**Keywords:** Entrepreneur; SMEs; Technology Readiness Index (TRI); Technology Adoption

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## INTRODUCTION

Indonesia's National Medium-Term Development Plan (RPJMN) 2020–2024, outlined in Presidential Regulation No. 18 of 2020, places strong emphasis on building economic resilience as a foundation toward becoming a developed nation by 2045. One of its priority agendas is empowering Micro, Small, and Medium Enterprises (SMEs) to reduce regional disparities and promote inclusive economic growth. SMEs contribute over 60% to the national GDP and employ 97% of the country's workforce, making them a key pillar of Indonesia's economic structure.

Regional disparities also affect SMEs' access to technological resources and readiness levels. In regions like West Java, where a high concentration of SMEs exists, disparities in digital infrastructure and economic activity are evident (Turap et al., n.d.). Understanding the regional context, including economic indicators and digital inclusion levels, is essential for tailoring technology adoption strategies to local needs (Turap et al., n.d.).

However, the ongoing shift toward digitalization presents new challenges. Many SME actors still lack the readiness to adopt and integrate digital technologies into their businesses. This low level of technology readiness could hinder SMEs' development and even widen socioeconomic gaps if not addressed properly (Meidina & Telkom, 2018). Mapping the level of technological readiness among SMEs, particularly in Java Island, is therefore crucial as a starting point for designing effective policy interventions.

While much of the existing TRI research has focused on consumer adoption, there is a growing body of literature exploring its application in SMEs (Marolt et al., 2020; Marolt et al., 2025). For instance, Marolt et al. (2025) highlight the role of external pressures, such as market demands and government regulations, in driving technology adoption in SMEs, often mitigating the impact of discomfort and insecurity. Similarly, González-Varona et al. (2021) emphasize the importance of organizational competence in overcoming psychological barriers to technology adoption. These studies suggest that the TRI framework needs to be refined and extended to better reflect the unique challenges and conditions faced by SMEs. Despite these advancements, there remains a limited understanding of how technology readiness specifically affects service utilization in the context of SMEs, particularly in regions like Java, Indonesia. This study seeks to fill this gap by examining the relationship between technology readiness (as measured by TRI) and technology-based service utilization in SMEs, contributing to the state of the art (SOTA) in this field.

This research is guided by three central questions: (1) What is the current level of technology readiness among SMEs in Java? (2) What factors influence the adoption or rejection of technology in this sector? (3) What strategies can be formulated to accelerate SMEs' digital transformation based on their readiness?. To answer these questions, the study adopts the Technology Readiness Index (TRI) developed by to assess SMEs' readiness from the entrepreneur's perspective. The TRI framework, comprising optimism, innovativeness, discomfort, and insecurity, serves as the basis of this research. A year-long quantitative survey is conducted across various SMEs in Java, using structured questionnaires. The data is then analyzed through factor analysis to map readiness patterns and classify SMEs based on their technology adoption potential.

This study offers several contributions. First, it introduces a new paradigm by shifting the TRI's focus from consumers or organizations to business owners in the SME sector. Second, it produces a segmentation model based on technology readiness, offering a decision-making tool for policymakers and support programs. Third, by focusing on Java Island, the research delivers localized insights relevant to Indonesia's strategic economic zones. Ultimately, this study aims to support evidence-based policies that drive inclusive and sustainable economic resilience through digital transformation.

## LITERATURE REVIEW

The concept of Technology Readiness Index (TRI) has long been used to assess the maturity of technologies, especially in high-tech industries such as aerospace, manufacturing, and energy (Blut & Wang, 2020). Most TRI research focuses on evaluating the technical development stage of a product or innovation, emphasizing the engineering or organizational level. However, bibliometric analysis reveals that the application of TRI has remained narrow in scope, particularly in its potential to explain how businesses, especially smaller ones, adopt or resist digital transformation.

Several studies have extended TRI to explore organizational adoption behavior (Blut & Wang, 2020; Jafari-Sadeghi et al., 2021) the readiness for AI adoption (Uren & Edwards, 2023a; Uren & Edwards, 2023b; Rocha et al., 2022), resistance among managers (Mahmud et al., 2023) and the role of culture (Sunny et al., 2019). Other scholars have applied the Technology Readiness Index (TRI), developed by Parasuraman (2000), to measure individuals' psychological tendencies toward new technologies through dimensions such as optimism, innovativeness, discomfort, and insecurity. TRI has become instrumental in understanding adoption behavior in service environments, particularly in studies involving e-service quality, self-service technologies, and consumer satisfaction (Dabholkar, 1996; Goutam et al., 2022; Shirahada et al., 2019).

While TRI research has largely focused on consumers or organizational users, there is still limited exploration of its adaptation for business actors, particularly SMEs in developing countries. Some attempts have

been made to apply TRI in small business contexts (Sarosa & Zowghi, 2003), yet very few have addressed the intersection of technology readiness and digital transformation specifically in the SMEs sector. Moreover, no significant study has mapped the TRL or TRI of SMEs in Indonesia at a local scale, such as Java Island, despite its strategic economic role. The urgency of SMEs' digital onboarding in Indonesia has been highlighted in various policy and academic discourses. According to (Parasuraman, 2000; Prasanna et al., 2019), measuring TRI among SME actors can provide clarity on the digital ecosystem's readiness and help direct appropriate interventions. Therefore, this study attempts to fill the research gap by adapting the TRI framework to assess SMEs' readiness at the individual business level. It also aims to generate a segmentation model that categorizes SMEs based on their technology readiness, offering actionable insights for policy design and program implementation.

The concept of Technology Readiness Index (TRI), introduced by Parasuraman (2000), provides a multidimensional framework to understand how individuals and organizations respond to technological change. TRI is built on four core dimensions: Optimism, Innovativeness, Discomfort, and Insecurity, each reflecting a distinct psychological stance toward technology. These dimensions interact to form a nuanced picture of technology adoption, where positive drivers coexist with inhibiting factors.

Optimism reflects the belief that technology enhances control, efficiency, and flexibility in everyday life and business operations. Individuals high in optimism often see technology as an enabler rather than a disruptor. For small and medium enterprises (SMEs) in Indonesia, this dimension is crucial because it captures the mindset shift from "technology as a cost" to "technology as an investment." For instance, an optimistic SME owner might adopt a digital payment system not only for convenience but also because they genuinely believe it will help streamline transactions and expand customer reach.

Innovativeness represents the willingness to be an early adopter and even a thought leader in using new tools. It captures the entrepreneurial curiosity that drives some individuals to try, experiment, and recommend new systems. Within the SME context, innovativeness differentiates proactive business owners those eager to explore e-commerce, point-of-sale (POS) software, or AI-based chatbots, technologies in payment systems, operating systems, marketplaces, and also financial technology for capital. In Indonesia, this dimension resonates strongly with younger SME owners who blend business with social media trends, making them natural catalysts for digital transformation.

The other two dimensions, Discomfort and Insecurity, highlight the human hesitation that often slows technology adoption. Discomfort captures feelings of being overwhelmed or out of control when faced with complex technology. This is a common sentiment among small business owners who may lack technical training or formal IT support. They may find digital accounting software "too complicated" or feel frustrated when online systems do not work as expected. Meanwhile, Insecurity reflects skepticism and distrust of technology, including concerns about security, reliability, and potential misuse. For Indonesian SMEs, insecurity often appears as fear of online fraud, data breaches, or "being scammed," which can deter them from using digital banking or cloud-based inventory systems.

When applied to SMEs, TRI's four dimensions offer a balanced lens with two drivers (optimism and innovativeness) and two inhibitors (discomfort and insecurity). This balance is valuable for understanding the push-pull dynamics of digital adoption. SME owners rarely reject technology outright; rather, they oscillate between enthusiasm and hesitation. TRI helps capture that tension. Despite these limitations, TRI remains a highly relevant framework for measuring SMEs' technology adoption readiness. Its human-centered approach recognizes that adoption is not simply about having access to tools but about how people feel about those tools. This is particularly important in the Indonesian SME landscape, where digital transformation is not only a policy agenda but also a deeply personal journey for millions of small business owners adapting to a rapidly changing economy. Based on the reviewed literature, this study formulates the following hypothesis:

H<sub>1</sub>: Optimism has a positive and significant effect on the use of technology-based services among SMEs.

Optimism, a key dimension of the Technology Readiness Index (TRI), reflects individuals' positive outlook on the potential of technology. Previous studies have consistently highlighted that optimism is positively associated with the adoption of new technologies. Blut & Wang (2020) emphasize that consumers who are optimistic about technology tend to embrace new technologies faster and use them more frequently. In the context of SMEs, Goutam et al. (2022) also found that technology readiness, including optimism, directly influences the willingness of business owners to integrate technology into their operations, which can enhance service utilization.

H<sub>2</sub>: Innovativeness has a positive and significant effect on the use of technology-based services among SMEs.

Innovativeness refers to the degree to which individuals are open to new experiences and new technologies. Innovativeness has been shown to drive technology adoption in SMEs, especially in dynamic markets. Dabholkar (1996) and Mahmud et al. (2023) provide evidence that SMEs with more innovative leaders are more likely to adopt technology-driven solutions to improve their business performance. Blut & Wang (2020) further supported this by showing that innovative individuals are more inclined to use technology-based services due to their greater

comfort and enthusiasm for exploring new technological solutions.

H<sub>3</sub>: Discomfort has a negative but non-significant effect on the use of technology-based services among SMEs.

Discomfort refers to the feelings of anxiety and lack of control when using new technology. While discomfort is often seen as a barrier, recent studies suggest that its impact might be mitigated by external factors such as support systems, government initiatives, and peer influence. Parasuraman (2000) indicated that discomfort could reduce technology adoption, but K. Mahmud et al. (2023), H. Mahmud et al. (2023), and Uren & Edwards (2023b) found that external pressures, such as market demands and regulations, can reduce the effects of discomfort. Uren & Edwards (2023b) also pointed out that facilitating conditions, such as training, can help SMEs overcome initial discomfort, leading to increased usage of technology-based services despite their reservations.

H<sub>4</sub>: Insecurity has a negative and significant effect on the use of technology-based services among SME

Insecurity, as a reluctance to adopt technology due to fear of the unknown or perceived risk, has been recognized as a significant barrier in technology adoption. Shirahada et al. (2019) found that insecurity often hampers technology usage, particularly when users are uncertain about the consequences of adoption. Jafari-Sadeghi et al. (2021) extended this idea by illustrating that the perception of risk and insecurity significantly impacts the willingness of managers and employees in SMEs to engage with new technologies. This supports the hypothesis that insecurity is a strong inhibitor of technology adoption in SMEs.

Based on the hypotheses, the following conceptual framework is proposed to illustrate the relationships among the variables. Optimism and innovativeness are expected to positively influence the use of technology-based services among SMEs, while discomfort and insecurity are considered as barriers. The model reflects the potential drivers and inhibitors that shape SMEs' adoption of technology-based services in Indonesia. To provide a clearer understanding of these relationships, the conceptual framework is illustrated in Figure 1, which outlines the theoretical model and guides the subsequent empirical analysis.

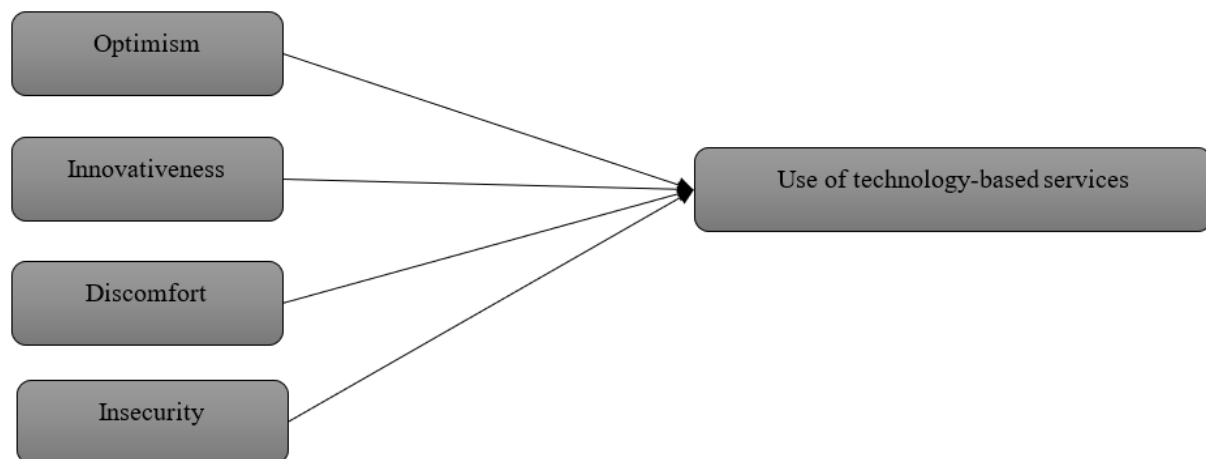


Figure 1. Conceptual Framework

## METHOD

This study employed a quantitative research design to examine the relationship between technology readiness and the use of technology-based services among SMEs in Java Island. The selection of a quantitative approach was based on the study's objective to test a hypothesis and identify the degree and direction of influence between variables using statistical analysis.

The population in this research consisted of SME actors operating across different sectors in Java. A total of 147 respondents were selected using purposive sampling, considering their active business status and willingness to adopt digital technology. Data were collected through structured questionnaires adapted from the Technology Readiness Index (TRI) developed by Parasuraman (2000), which measures four dimensions: optimism, innovativeness, discomfort, and insecurity.

The variables measured in this study were (1) Technology Readiness as the independent variable, and (2) Use of Technology-based Services as the dependent variable. To categorize responses, frequency distribution analysis was conducted, classifying readiness and usage into low, moderate, and high categories based on score ranges.

Before performing hypothesis testing, classical assumption tests were conducted to ensure that the data met the requirements for linear regression analysis. These included the normality test using Kolmogorov-Smirnov and P-P Plot graphics, and the heteroscedasticity test using Glejser and scatterplot methods. Both tests confirmed that the assumptions were met.

To analyze the effect of technology readiness on service usage, the study employed multiple regression analysis. This approach was chosen to examine the relationship between multiple predictor variables (technology readiness factors) and the dependent variable (service usage). Technology readiness was measured using four dimensions: optimism, innovativeness, discomfort, and insecurity. The model's significance was tested using the F-test for overall model fit, the t-test for partial influences of each predictor, and the coefficient of determination ( $R^2$ ) to measure the proportion of variance in service usage explained by the predictors. The statistical analysis was conducted using standard significance levels ( $p < 0.05$ ) to assess the strength and reliability of the observed relationships.

## RESULT

This study explored how the four dimensions of the Technology Readiness Index (TRI): optimism, innovativeness, discomfort, and insecurity influence the use of technology services among SMEs in Java, Indonesia. The findings reveal a nuanced picture of SME readiness, where enthusiasm and caution coexist, and where psychological factors significantly shape the trajectory of technology adoption.

Optimism emerged as a strong and positive predictor of technology use ( $\beta = 0.189$ ,  $p = 0.002$ ). This result suggests that SME owners who believe that technology improves efficiency and flexibility are more inclined to integrate digital solutions into their business practices. In the Indonesian context, where many small businesses are in the process of digital transformation, optimism often translates into a willingness to adopt tools like e-wallets, WhatsApp Business, or point-of-sale applications. This aligns with Parasuraman's (2000) original assertion that optimism acts as a "driver" of readiness, encouraging individuals to see technology not merely as a tool but as an opportunity to expand their business horizons.

Innovativeness also showed a significant and positive effect on technology usage ( $\beta = 0.244$ ,  $p = 0.027$ ). SME owners who are curious and eager to try new solutions are naturally positioned as early adopters within their communities. Interestingly, this finding resonates with the generational divide often seen in SMEs: younger entrepreneurs tend to exhibit higher innovativeness, readily experimenting with new platforms, while older owners may prefer familiar systems. Yet, innovativeness among SMEs is not limited by age alone; it often reflects an entrepreneurial mindset that sees experimentation as part of survival and growth in competitive markets.

Conversely, discomfort, the sense of being overwhelmed or unable to control technology, did not show a significant relationship with technology use ( $\beta = 0.006$ ,  $p = 0.925$ ). At first glance, this may seem counterintuitive, as discomfort is typically seen as a barrier. However, the result might indicate that discomfort alone is not enough to stop SMEs from adopting technology, especially when external pressures (e.g., customer expectations or government initiatives) push them toward digitalization. In other words, some SMEs may feel uncomfortable with technology, but they adopt it anyway because they see no viable alternative to staying competitive.

Finally, insecurity, the lack of trust in technology's reliability and safety, showed a significant negative effect on technology use ( $\beta = -0.209$ ,  $p = 0.014$ ). This suggests that SME owners who are skeptical or fearful about security issues (e.g., online fraud, data misuse) are less likely to embrace digital services fully. Insecurity reflects a deeper psychological hesitation that cannot be easily overridden by external pressure, highlighting the importance of addressing trust and security concerns through targeted interventions such as digital literacy programs or guarantees from technology providers.

Taken together, the regression model explains 16.7% of the variance in technology usage ( $R^2 = 0.167$ ), which is modest but meaningful for behavioral research. The remaining variance likely comes from external and structural factors such as access to infrastructure, financing, and government policies that were outside the scope of this study but are crucial in shaping SME digitalization.

From a broader perspective, these findings reinforce the dual nature of technology readiness: optimism and innovativeness act as accelerators, while discomfort and insecurity function as brakes. For Indonesian SMEs, the "brakes" do not always stop the journey; they slow it down, and in some cases, create uneven adoption patterns. Policymakers and business support agencies must therefore approach digitalization strategies with this human dimension in mind. Building optimism and innovativeness through success stories, peer learning, and accessible technology demonstrations can create momentum. Simultaneously, insecurity must be reduced through stronger assurances on data privacy, fraud protection, and user support.

In conclusion, this study not only confirms the relevance of TRI in the SME context but also highlights that technology adoption is as much an emotional journey as it is a technical one. For many small business owners in Indonesia, embracing digital tools means negotiating between hope and fear, confidence and skepticism. Understanding this delicate balance is key to designing interventions that truly empower SMEs to thrive in an increasingly digital economy.

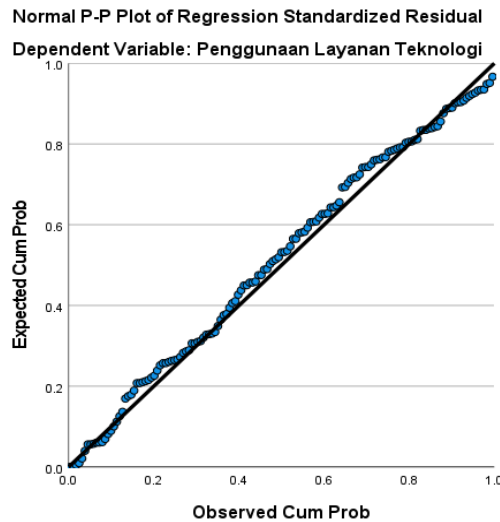
### Data Analysis: Classical Assumption Tests

Before hypothesis testing, classical assumption tests were conducted to validate the suitability of linear regression analysis. The normality test using the Kolmogorov-Smirnov test showed a significance value of 0.200, indicating that residuals followed a normal distribution.

**Table 1.** Residual Normality Test (K–S Method)

Variable	Test	p	Interpretation
Residual	Kolmogorov-Smirnov	0.200	Normally distributed

The data above was supported by the P-P Plot graph, where data points were aligned along the diagonal line.



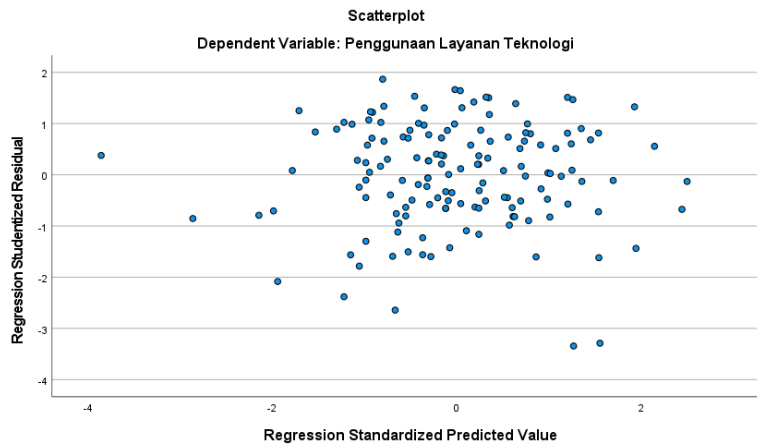
**Figure 2.** P–P Plot of Regression Standardized Residuals

The heteroscedasticity test, using both the Glejser test and scatterplot analysis, indicated no pattern and significance above 0.05, confirming that the assumption of homoscedasticity was satisfied.

**Table 2.** Heteroscedasticity Test Result (Glejser Method)

Test	Independent Variables	P	Interpretation
Glejser	Optimism	0.242	No heteroscedasticity
	Innovativeness	0.366	No heteroscedasticity
	Discomfort	0.658	No heteroscedasticity
	Insecurity	0.882	No heteroscedasticity

Based on the Glejser test, the four Technology Readiness Index (TRI) dimensions: *optimism*, *innovativeness*, *discomfort*, and *insecurity*. Using the Glejser test, the results indicated that the significance values for all predictors were greater than 0.05 ( $p > 0.05$ ). This finding confirms that the regression model is free from heteroskedasticity, meaning the residuals are evenly distributed and not systematically influenced by any of the TRI dimensions. This result is further supported by the scatter plot, which shows randomly dispersed residuals without any visible pattern. Together, these findings confirm that the assumption of homoscedasticity is satisfied, allowing the regression model to proceed reliably.



**Figure 3.** Scatter Plot of Regression Residuals

With the fulfillment of both classical assumptions: normality and homoscedasticity, the dataset is deemed suitable for linear regression analysis. The normally distributed residuals ensure the validity of parametric statistical inference, while the absence of heteroscedasticity confirms the consistency of error variance across observations. These results indicate that the regression model can produce reliable estimates and hypothesis testing outcomes. Therefore, the analysis proceeds to examine the effect of technology readiness on the use of technology-based services among SMEs. Having established that residuals were evenly distributed with no signs of heteroskedasticity, attention then turned to evaluating potential relationships among the independent variables through a multicollinearity assessment, employing the Variance Inflation Factor (VIF).

**Table 3.** Multicollinearity Test Results Using the Variance Inflation Factor (VIF)

Test	Independent Variables	VIF	Interpretation
Glejser	Optimism	1.372	No Multicollinearity
	Innovativeness	1.844	No Multicollinearity
	Discomfort	1.995	No Multicollinearity
	Insecurity	1.566	No Multicollinearity

The multicollinearity test using the Variance Inflation Factor (VIF) indicated that all independent variables had VIF values below the commonly accepted threshold of 10 ( $VIF < 10$ ). This result confirms that no multicollinearity issues were present in the model, thereby satisfying the multicollinearity assumption and ensuring the reliability of the regression estimates.

**Research Analysis: Hypothesis Testing**

The multiple linear regression analysis was conducted to examine the influence of the independent variables on the dependent variable, both collectively (simultaneously) and individually (partially). The following section presents the results of the multiple regression model assessing the impact of the four dimensions of technology readiness on the use of technology-based services.

The multiple linear regression model estimating the influence of the four dimensions of technology readiness on the use of technology-based services is presented as follows:

**Table 4.** Regression Coefficients and Significance Levels

Independent Variables	Unstandardized Coefficient (B)	t-value	p-value	Significance
Constant	43.963	9.436	0.000	Significant
Optimism	43.963	9.436	0.000	Significant
Innovativeness	0.189	3.102	0.002	Significant
Discomfort	0.244	2.238	0.027	Not Significant
Insecurity	0.006	0.094	0.925	Significant

$$Y = 43.963 + 0.189 X1 + 0.244 X2 + 0.006 X3 - 0.209 X4 + e$$

Where X1 represents optimism, X2 represents innovativeness, X3 represents discomfort, and X4 represents insecurity. The analysis reveals that optimism exerts a positive and statistically significant influence on technology usage ( $\beta=0.189$   $\beta = 0.189$ ;  $t = 3.102$ ;  $p = 0.002$ ). This indicates that higher levels of optimism among

SME owners are associated with greater adoption of technology-based services. Similarly, innovativeness also demonstrates a positive and significant relationship with technology usage ( $\beta=0.244$ ;  $t = 2.238$ ;  $p = 0.027$ ), suggesting that SMEs with a stronger inclination to experiment with new tools are more likely to integrate digital solutions into their operations.

In contrast, discomfort shows a non-significant relationship with technology usage ( $\beta=0.006$ ;  $t = 0.094$ ;  $p = 0.925$ ). This result implies that feelings of unease or being overwhelmed by technology do not statistically inhibit SMEs from using digital services within this sample.

Finally, insecurity exhibits a negative and statistically significant effect on technology usage ( $\beta=-0.209$ ;  $t = -2.481$ ;  $p = 0.014$ ). This suggests that lower levels of insecurity, meaning greater trust in the safety, reliability, and integrity of technology, contribute to higher adoption rates of technology-based services among SMEs.

Collectively, these findings underscore the dual nature of technology readiness: optimism and innovativeness serve as key drivers of technology adoption, while insecurity acts as a significant barrier. The absence of significance for discomfort highlights that apprehension alone may not be enough to deter usage, especially when external factors (e.g., customer expectations or market trends) compel SMEs to engage with digital tools regardless of personal hesitation.

### Significance Testing

To ensure the robustness of the regression findings, a series of significance tests was conducted using multiple linear regression to examine the influence of the four technology readiness dimensions, optimism, innovativeness, discomfort, and insecurity, on the dependent variable, technology-based service usage. The significance testing was structured into three key components: the overall model significance (F-test), the coefficient of determination ( $R^2$ ), and the individual contribution of each predictor (t-test).

#### Simultaneous Test (F-test)

The F-test evaluates whether the independent variables collectively exert a statistically significant effect on the dependent variable. As shown in Table 9, the F-test produced an F-value of 7.106 with a significance level of  $p = 0.000$ .

**Table 5.** Simultaneous Significance Test (F-test)

Dependent Variable	F-value	p-value	Significance
Technology-Based Service Usage	7.106	0.000	Significant

The obtained F-value (7.106) exceeded the critical F-table value of 2.435 at a 5% significance level ( $df = 4,142$ ). Furthermore, the p-value was well below the 0.05 threshold ( $p < 0.05$ ), confirming that the overall model is statistically significant. This indicates that, when considered simultaneously, the four TRI dimensions explain a meaningful portion of the variance in technology-based service usage among SMEs.

From a theoretical perspective, this finding supports the notion that technology adoption is multidimensional: no single psychological factor entirely explains SME engagement with digital services. Instead, it is the combined interplay of optimism, innovativeness, discomfort, and insecurity that shapes the adoption landscape.

#### Coefficient of Determination ( $R^2$ )

The coefficient of determination ( $R^2$ ) was used to evaluate the explanatory power of the regression model.

**Table 6.** Coefficient of Determination ( $R^2$ )

Independent Variable	$R^2$
Technology-Based Service Usage	0.167

The analysis yielded an  $R^2$  value of 0.167, indicating that the four dimensions of technology readiness can explain 16.7% of the variance in technology-based service usage. The remaining variance (83.3%) is attributed to factors not included in the model.

#### Partial Significance Test (t-test)

The t-test was conducted to evaluate the individual contribution of each dimension of technology readiness to the use of technology-based services. This analysis helps to identify which psychological factors are most influential for SMEs when deciding to adopt or engage with technology.

**Table 7.** Simultaneous Significance Test (F-test)

Dependent Variable	t-value	p-value	Significance
Constant	9.436	0.000	Significant

Optimism	9.436	0.000	Significant
Innovativeness	3.102	0.002	Significant
Discomfort	2.238	0.027	Not Significant
Insecurity	0.094	0.925	Significant

The results reveal several important insights. Optimism shows a positive and significant effect ( $t = 3.102$ ,  $p = 0.002$ ), indicating that SME owners who believe that technology will improve efficiency and opportunities are more likely to adopt and actively use technology-based services. Similarly, innovativeness is also a significant positive driver ( $t = 2.238$ ,  $p = 0.027$ ). Owners with a tendency to experiment and explore new tools are more open to integrating technology into their operations, often becoming early adopters in their communities.

Interestingly, discomfort — the feeling of being overwhelmed or unable to control technology — was not significant ( $t = 0.094$ ,  $p = 0.925$ ). This suggests that even if some SME owners feel uneasy or hesitant, these feelings do not meaningfully stop them from using technology. External pressures, such as customer demands or market trends, may override that discomfort and push them toward digital adoption regardless of their apprehension.

Finally, insecurity demonstrates a significant negative effect ( $t = -2.481$ ,  $p = 0.014$ ). This finding highlights that trust matters: SMEs that are less worried about fraud, data misuse, or the reliability of technology are far more likely to embrace and expand their use of digital tools. Conversely, higher insecurity acts as a barrier, slowing down the adoption process.

Taken together, these results paint a balanced and human picture of technology readiness. Optimism and innovativeness provide the push for SMEs to go digital, while insecurity applies the brake, and discomfort, though present, doesn't seem to stop the journey. This reinforces the idea that digital transformation strategies for SMEs should not only introduce new tools but also build trust and confidence to ensure those tools are truly embraced.

### **Hypothesis 1 (H<sub>1</sub>): Optimism → Technology-Based Service Usage**

The findings support H1, showing that optimism exerts a positive and significant effect ( $t = 3.102$ ;  $p = 0.002$ ). This result suggests that SME owners who see technology as an enabler offering efficiency, growth, and opportunities are more inclined to integrate digital solutions into their businesses. The result aligns with Parasuraman's (2000) assertion that optimism acts as a key driver of technology readiness, fostering willingness to explore and adopt new tools. The practical implication of this result is that SMEs should focus on cultivating a positive outlook toward digital technologies among their leaders and employees, as this can significantly enhance their willingness to adopt and implement new digital solutions. Furthermore, training programs and awareness campaigns could help increase optimism by emphasizing the benefits of technology adoption.

### **Hypothesis 2 (H<sub>2</sub>): Innovativeness → Technology-Based Service Usage**

The analysis also confirms H2 ( $t = 2.238$ ;  $p = 0.027$ ). Innovativeness, the tendency to try new technologies and experiment with novel solutions, significantly encourages SME owners to engage with technology-based services. This resonates with studies by Lin & Chang (2013), emphasizing that innovative entrepreneurs often act as early adopters and even influence their peers to adopt digital practices. For SMEs, being innovative provides them with a competitive edge and enables them to stay ahead in a rapidly changing digital landscape. Implications for practice suggest that SMEs should foster a culture of innovation, encouraging experimentation and risk-taking with new technologies. This can be achieved through collaborations with tech providers, incubators, and innovation hubs that allow SMEs to experiment and test digital tools before full-scale implementation.

### **Hypothesis 3 (H<sub>3</sub>): Discomfort → Technology-Based Service Usage**

The findings do not support H3 ( $t = 0.094$ ;  $p = 0.925$ ). While discomfort (feeling overwhelmed or lacking control) theoretically should act as an inhibitor, the data reveal that this factor does not significantly hinder technology use among SMEs. This may indicate that external pressures, such as customer demand, competition, or government digitalization initiatives, may push SMEs to adopt technology despite their uneasiness. This finding is surprising, as discomfort is often linked to reluctance in adopting new technologies (Parasuraman, 2000). However, this result may suggest that external pressures, such as customer demand, competition, or government digitalization initiatives, play a larger role in driving technology adoption. SMEs might feel compelled to adopt digital solutions to meet market needs, even if they are initially uncomfortable with the technology. Practical implications indicate that SMEs, even if uneasy about new technologies, should not be discouraged. Rather, external factors like government incentives, digital transformation programs, and customer expectations could act as significant motivators for adoption. To alleviate discomfort, businesses could also provide training and support systems to enhance users' confidence and reduce feelings of overwhelm.

### **Hypothesis 4 (H<sub>4</sub>): Insecurity → Technology-Based Service Usage**

The results support H4, showing a negative and significant effect of insecurity on technology-based service usage ( $t = -2.481$ ;  $p = 0.014$ ). This suggests that SMEs who feel uncertain about data privacy, system reliability, or the risk of fraud are less likely to fully embrace digital solutions. The finding reinforces the need for trust-building measures (e.g., secure payment systems, fraud protection campaigns) to address these fears. This finding aligns with previous research that highlights the critical role of trust in technology adoption (Jafari-Sadeghi et al., 2021). SMEs are particularly vulnerable to security risks and, as a result, may hesitate to fully implement digital solutions. The implications for practice are clear: to overcome these barriers, SMEs need to build trust by investing in secure systems, implementing fraud protection measures, and ensuring compliance with data protection regulations. Trust-building initiatives, such as transparent communication about security protocols and reliable customer service, are essential for mitigating insecurities and encouraging SMEs to fully embrace digital technologies.

## DISCUSSION

The findings of this study demonstrate that the Technology Readiness Index (TRI) dimensions optimism, innovativeness, discomfort, and insecurity play a nuanced role in shaping the use of technology-based services among SMEs in Java, Indonesia. This echoes Parasuraman, (2000) foundational work, which conceptualized TRI as a balance of drivers and inhibitors of technology adoption. Our regression analysis reinforces this conceptualization: optimism and innovativeness emerged as significant drivers of technology usage, while insecurity served as a notable barrier. Surprisingly, discomfort, although theoretically an inhibitor, was not statistically significant, suggesting a more complex dynamic in SMEs' digital adoption behavior.

### Optimism on Technology-Based Service Usage

Optimism as a positive driver. The significant relationship between optimism and technology usage ( $t = 3.102$ ;  $p = 0.002$ ) confirms that SME owners who perceive technology as beneficial are more willing to adopt digital solutions. Blut and Wang's (2020) meta-analysis supports this interpretation, finding that optimism consistently correlates with higher technology engagement across industries. Similarly, Gao et al. (2022) found that optimistic attitudes enhance the smart customer experience, reinforcing the notion that belief in technology's potential catalyzes adoption. In the SMEs context, optimism may translate into openness to tools like digital payments or social commerce platforms, which are seen as opportunities rather than burdens.

### Innovativeness on Technology-Based Service Usage

Innovativeness and early adoption behavior. Innovativeness also showed a positive and significant effect ( $t = 2.238$ ;  $p = 0.027$ ). This aligns with Jafari-Sadeghi et al. (2021), who argued that innovativeness drives digital transformation and market expansion for entrepreneurial firms. In SMEs, innovativeness likely reflects the willingness of owners, especially younger or more digitally savvy ones, to experiment with e-wallet systems, e-commerce stores, or AI-based customer service tools. This finding also resonates with Dabholkar's (1996) early work, which identified "technology curiosity" as a precursor to self-service technology use.

The surprising insignificance of discomfort. Contrary to expectations, discomfort defined as feeling overwhelmed or lacking control over technology was not a significant predictor ( $t = 0.094$ ;  $p = 0.925$ ). One explanation, supported by Lestari et al. (2024) as Rothenberg et al. (2016b) report, Rothenberg and Sarosa & Zowghi (2003), is that SMEs in Indonesia often adopt technology out of necessity rather than preference. Even if owners feel uncomfortable, external pressures such as market demand or platform requirements (e.g., being on Tokopedia to stay competitive) may compel them to engage with technology regardless of their hesitation. This finding mirrors Jaafar et al. (2007), who found that discomfort did not strongly hinder adoption when organizational or market pressures were high.

### Discomfort on Technology-Based Service Usage

Hypothesis 3 posited that discomfort, characterized by feelings of being overwhelmed or lacking control over technology, would negatively affect technology-based service usage. However, the findings of this study ( $t = 0.094$ ;  $p = 0.925$ ) do not support this hypothesis, indicating that discomfort does not significantly hinder technology use among SMEs. This result is contrary to theoretical expectations based on earlier research, where discomfort is often identified as a barrier to the adoption of technology (Parasuraman, 2000). However, the non-significance of this effect aligns with more recent studies highlighting that other factors can mitigate discomfort in the context of digital transformation. External Pressures as a Driving Force for Technology Adoption. Recent literature suggests that external pressures, such as customer demand, competition, and government digitalization initiatives, play a crucial role in driving technology adoption despite the presence of discomfort. For SMEs, these pressures can often outweigh the initial discomfort, pushing organizations to embrace digital technologies even when they may feel overwhelmed. Marolt et al. (2025) argue that these external pressures can reduce the impact of discomfort, as firms prioritize technological adoption to remain competitive in an increasingly digital marketplace. Facilitating Conditions and Organizational Support. Another explanation for the non-significant

effect of discomfort comes from the concept of facilitating conditions, as described in the Unified Theory of Acceptance and Use of Technology (UTAUT). Mahmud et al. (2023) and González-Varona et al. (2021) note that the availability of resources, training, and support systems can reduce the discomfort felt by individuals or organizations adopting new technology. In the case of SMEs, providing training and customer support may mitigate discomfort, enabling firms to proceed with technology adoption more smoothly. This aligns with our findings research that highlights the importance of developing organizational competencies and providing adequate support to overcome initial resistance to digital transformation. The Influence of External Social Factors, The Theory of Planned Behavior emphasizes that behaviors are influenced by external social factors in addition to individual attitudes and feelings. In the context of SMEs, external social influences, such as industry norms and peer pressure, may encourage the adoption of technology even in the presence of discomfort. Mahmud et al. (2023) and González-Varona et al. (2021) further explain that social influence can significantly impact technology adoption, often overpowering individual discomfort or unease. As such, SMEs may adopt technology to align with industry standards or peer practices, even if they experience discomfort. Gradual Familiarity and Reduced Discomfort Over Time. Another consideration is that discomfort may decrease over time as SMEs become more familiar with the technology. Several studies suggest that initial discomfort can subside as users gain experience and confidence with the technology (Venkatesh et al., 2003). As SMEs become more comfortable with technology through usage and training, the negative impact of discomfort may lessen, allowing for greater adoption and integration of technology.

### **Insecurity on Technology-Based Service Usage**

Insecurity as a barrier. Insecurity fears around fraud, data misuse, or system reliability showed a negative and significant effect on technology usage ( $t = -2.481$ ;  $p = 0.014$ ). This is consistent with Mahmud et al. (2023) found that insecurity can trigger resistance to technological innovation, and with Sunny et al. (2019), who noted that cultural and trust factors strongly shape readiness. For Indonesian SMEs, concerns about online fraud, scams, and privacy breaches remain salient, suggesting that any digitalization initiative must incorporate trust-building measures such as secure payment systems, verified platforms, or awareness campaigns.

Broader implications for SMEs' digital transformation. The simultaneous significance of all four TRI dimensions (F-test = 7.106,  $p = 0.000$ ) highlights that SMEs' technology adoption is multifaceted. As Uren & Edwards (2023b) suggest, technology readiness should be seen as an organizational journey, where psychological readiness interacts with structural enablers and barriers. Our results imply that enhancing SMEs adoption will require dual strategies: (1) amplifying drivers by fostering optimism and innovativeness through peer learning, success stories, and accessible training; and (2) mitigating inhibitors by reducing insecurity through assurances of data safety and fraud prevention.

The findings of this study contribute to the Technology Readiness Index (TRI) framework by extending its application in the context of Micro, Small, and Medium Enterprises (MSMEs). While discomfort was expected to act as a barrier to technology adoption, the study reveals that this psychological factor may not play as significant a role as previously theorized, especially when external pressures and facilitating conditions are present. This highlights the need for refinement of the TRI framework, particularly in organizational contexts where external factors such as market demands, competition, and government digitalization initiatives can outweigh individual discomfort (Marolt et al., 2025). Furthermore, the study's findings imply that SMEs' technology adoption processes are likely shaped by a combination of psychological factors and external pressures. This finding is consistent with the Unified Theory of Acceptance and Use of Technology (UTAUT), which emphasizes the importance of social influences and facilitating conditions (Venkatesh et al., 2003). Thus, to enhance adoption rates, practitioners and policymakers should focus on building support systems, providing training, and ensuring infrastructure readiness for SMEs, alongside addressing any psychological barriers like discomfort. However, the modest  $R^2$  (16.7%) suggests that other unmeasured factors, such as capital availability, infrastructure, and regulations, likely play a crucial role in shaping technology adoption. These factors should be considered in future models, as they may complement the psychological aspects explored in this study. Exploring these variables could provide a more holistic understanding of the complex drivers behind technology adoption in MSMEs.

Integrating local SMEs realities. Local context matters. Juliprijanto et al. (2017) found that many Indonesian SMEs operate with limited capital, rely heavily on self-financing, and are cautious in decision-making conditions that mirror our sample profile (95.9% micro-scale, 94.6% self-funded). These realities explain why optimism and innovativeness matter so much; they are the psychological levers that can spark adoption despite resource constraints. But they also underline why insecurity must be addressed: if owners feel unsafe, they will retreat from the digital space, no matter how promising the tools may seem.

### **CONCLUSION**

This study examined the influence of the four dimensions of the Technology Readiness Index (TRI): optimism, innovativeness, discomfort, and insecurity on the use of technology-based services among micro, small,

and medium enterprises (SMEs) in Java, Indonesia. The results provide clear evidence that technology readiness is a multidimensional construct that both drives and inhibits digital adoption.

The findings revealed that optimism and innovativeness significantly and positively influence technology usage, underscoring their role as key psychological drivers that encourage SMEs to adopt and integrate digital tools into their operations (Blut & Wang, 2020; Jafari-Sadeghi, 2021). Conversely, insecurity emerged as a significant barrier, reflecting persistent concerns about fraud, data misuse, and system reliability (Mahmud et al., 2023; Sunny et al., 2019). Surprisingly, discomfort, although conceptually an inhibitor, was not statistically significant, suggesting that SMEs may adopt technology even when feeling overwhelmed, often out of necessity or competitive pressure (Rothenberg et al., 2016b). Overall, the regression model confirmed that the four TRI dimensions collectively explain 16.7% of the variance in technology usage, demonstrating their relevance but also signaling that structural, financial, and policy factors outside the TRI framework play an equally important role (Uren & Edwards, 2023a; Uren & Edwards, 2023a).

For practice and policy, these findings highlight the need for a dual strategy: (1) amplify drivers by fostering optimism and innovativeness through training, peer learning, and accessible success stories; and (2) mitigate inhibitors by building trust and reducing insecurity via stronger guarantees of data safety, secure payment systems, and fraud prevention campaigns. In sum, this study affirms TRI's relevance for understanding SMEs' digital readiness in emerging markets, while also emphasizing that digital transformation is not purely a technical journey; it is a human one. Addressing both the hopes and fears embedded in SMEs' technology readiness will be essential to unlock their full digital potential and ensure inclusive economic growth.

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