P ISSN 2301.9093 | E ISSN 2540.8259

JMDK Jurnal Manajemen dan Kewirausahaan

https://jurnal.unmer.ac.id/index.php/jmdk/index

Vol. 14, No. 1, 2026: 16-28

Human Resource Competence and Digital Payment Adoption in MSMEs: An Extended TAM Framework

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Abstract

The current research explores the primary drivers influencing the implementation of electronic payment mechanisms within small-scale business sectors in West Sulawesi, Indonesia. By integrating an expanded Technology Acceptance Model (TAM), this paper examines not only the direct effects of perceived utility and usability but also the functional role of human resource competence as a moderating factor. A cross-sectional quantitative research design was applied. Survey data were collected from 250 MSME owners/managers in West Sulawesi using purposive sampling. The conceptual model, which includes direct and moderating effects, employs purposive sampling and distributes questionnaires. Findings indicate that perceptions of usefulness and ease of use are robust determinants of digital transaction adoption, aligning with established TAM frameworks. Crucially, the study identifies that human resource competence significantly strengthens the impact of perceived usability on actual adoption behavior, suggesting that internal expertise acts as a catalyst for technological integration. This work provides a substantial theoretical advancement by being among the initial empirical efforts to incorporate human capital dimensions as a moderator within the TAM to clarify digital payments by MSMEs in developing countries.

Keywords: Digital Payment Adoption; Human Resource Competence; Technology Acceptance Model.

Article History:
Received: 2025-11-07
Revised: 2026-03-15
Accepted: 2026-03-17
Publish: 2026-06-30

DOI:
10.26905/jmdk.v14i1.16323

How to cite: Ady DJ, A., Mas'ud, A. A., Tenriyola, A. P. (2026). Human Resource Competence and Digital Payment Adoption in MSMEs: An Extended TAM Framework. *Jurnal Manajemen dan Kewirausahaan, 14*(1), 16-28. https://doi.org/10.26905/jmdk.v14i1.16323

INTRODUCTION

Statistically, Indonesia's economic structure is dominated by the small business sector, which accounts for 99% of all national business entities and contributes more than 60% to the country's Gross Domestic Product (GDP). Nevertheless, a substantial disparity remains: fewer than one-fifth of the 64 million local business units have optimized the use of digital infrastructure in their operations, highlighting a persistent gap in technological integration despite proactive government mandates. According to Tambunan (2020), this significant economic weight underscores the urgency of the national strategic push towards MSME digitalization, as evidenced by various government programs such as "Level Up 2024" and the target set by the Minister of Communication and Digital to integrate 30 million MSMEs onto digital platforms (Sivakami & Suresh, 2023). This context frames the

present research not merely as an academic exercise but as an investigation into a critical national economic priority. Despite strong government initiatives, including the promotion of the Quick Response Code Indonesian Standard (QRIS) to foster broader financial inclusion, a significant "digital payment gap" persists. There is a sharp contrast between policy ambitions and on-the-ground reality. Evidence indicates a low rate of digital adoption, with only about 19.5% of the 64.2 million MSMEs having utilized digital platforms (J. Sun & Zhang, 2024). Furthermore, MSME operators themselves view technology adoption as a major operational hurdle. This paradox forms the central research problem: in an environment with strong institutional encouragement and clear potential benefits, why does the adoption of digital payments among MSMEs remain slow and uneven?

The persistent gap in digital adoption among MSMEs suggests that the national digitalization strategy, seemingly built on an 'if you build it, they will come' assumption, has a fundamental flaw: it treats a human capability problem as a technology availability issue. While traditional frameworks like the Technology Acceptance Model (TAM) identify Perceived Usefulness (PU) and Perceived Ease of Use (PEU) as essential foundations, they often remain limited by a focus on purely technological characteristics. The distinct novelty of this study lies in addressing this theoretical gap by integrating Human Resource Competence (HRC) as a socio-technical moderator rather than a mere antecedent. (Kerimbayeva et al., 2024). Unlike previous studies that treat competence as a direct predictor, this research positions HRC as a critical boundary condition that determines the strength of the relationship between technological perceptions and actual adoption. (Chong & Zainal, 2024; Said & Soi, 2025). Consequently, the current inquiry delivers a sophisticated clarification of the adoption dilemma within emerging markets, presenting a fresh perspective on the role of internal workforce capabilities as an essential catalyst for technological integration.

The mentality and resilience of business owners often determine the line between failure and success. In the entrepreneurship literature, the Technology Acceptance Model (TAM) has been identified as a source of competitive advantage for business actors. Entrepreneurs with a high level of technological understanding tend to have strong confidence in their abilities, maintain a positive outlook on the future, and bounce back from difficulties. (Setiawan et al., 2023). The extent to which individuals accept and use new technology directly influences their attitudes and behaviors, which in turn affect organizational performance, innovation, and creativity. (Asmara et al., 2023; Nurqamarani et al., 2024). While digital literacy drives the willingness to advance, competence (HRC) determines the ability to effectively adopt and use new tools, such as digital payment systems. (Daryono, D; Dewi, 2024). Therefore, this research focuses on the measurable and developable aspects of competence as a crucial bridge between technological potential and the realization of digital understanding, benefiting MSMEs. This study introduces Human Resource Competence (HRC), encompassing the knowledge, skills, and abilities of the MSME workforce as a critical and under-researched factor. Technology is not adopted in a vacuum; its potential can be optimized or hindered by the organization's human capital. (Rahadian & Thamrin, 2023). The persistent gap in digital adoption among MSMEs suggests that current strategies, which focus heavily on infrastructure availability, may overlook a fundamental barrier: human capability. Even though PU and PEU are recognized as foundational pillars of adoption, their scope is largely limited to technical attributes. This research posits that the efficacy of these drivers is contingent on Human Resource Competence (HRC), a fundamental boundary condition. Rather than merely shaping perceptions, HRC serves as an 'activation mechanism' that determines the extent to which these perceptions translate into adoption. In the context of MSMEs, where resources are scarce, competence provides the resilience and skill set necessary to translate technological potential into operational reality, thereby moderating the strength of TAM-based relationships. Given this socio-technical perspective, it is imperative to empirically investigate how these internal human capabilities interact with technological perceptions to shape adoption behavior. Consequently, this study addresses the following research questions (Q):

Q_1: To what extent do Perceived Ease of Use and Perceived Usefulness influence the adoption of digital payments among MSMEs in West Sulawesi?

Q_2: Does Human Resource Competence moderate the relationship between Perceived Ease of Use and the adoption of digital payments?

Q_3: Does Human Resource Competence moderate the relationship between Perceived Usefulness and the adoption of digital payments?

The paper is organized to address these objectives through a logical sequence of sections. Following this introduction, the second part synthesizes existing literature and proposes the research hypotheses. The third section details the methodological approach and research design, while the fourth section reports the statistical results and empirical outcomes. A critical synthesis of these findings and their broader implications is presented in the fifth section, with the final part offering concluding remarks and strategic recommendations for stakeholders and future scholars.

LITERATURE REVIEW

The Technology Acceptance Model (TAM)

Since its inception by Davis (1993), the Technology Acceptance Model (TAM) has remained a predominant theoretical framework for evaluating user engagement with new systems. In this framework, perceived usefulness (PU) reflects an entrepreneur's subjective belief that integrating certain digital tools will significantly improve their work effectiveness and operational productivity. It reflects the value-added component that encourages business actors to shift from conventional to automated transaction models (Aditya & Wardhana, 2016). Within the MSME sector, the concept of Perceived Usefulness (PU) is linked to the belief that electronic payment systems can streamline business processes, expand market access, and drive revenue growth. Meanwhile, perceived ease of use (PEU) refers to the degree to which a user expects that operating a particular technology system will not require excessive physical or cognitive effort (Asmara et al., 2023). In this study, PEU encompasses the view that digital payment interfaces are user-friendly, transaction steps are uncomplicated, and the system is manageable without a significant cognitive burden. An extensive body of literature has validated the use of the Technology Acceptance Model (TAM) to explain how users adopt diverse technologies, including digital payments, e-commerce, and information systems across different organizational contexts (Usman et al., 2024). In MSMEs in developing countries, PU and PEU are consistently identified as critical predictors of adoption intention and behavior, providing a robust theoretical foundation for this study. The TAM has proven to be a robust explanation for the adoption of various technologies, including digital payments, e-commerce, and information systems in different organizational contexts (Gupta et al., 2022).

In the context of MSMEs in developing countries, PU and PEU are consistently identified as important predictors of adoption intention and behavior. This solid, well-tested framework serves as a robust theoretical foundation for the extended model in this study. Beyond the core constructs of TAM, the adoption of digital payments by MSMEs is influenced by a constellation of factors that create a unique adoption context. The literature (Ezebilo et al., 2019) identifies various relevant drivers and barriers. Adoption drivers, in addition to PU and PEU, include convenience, transaction speed, and potential cost savings. The ability to access a wider market and cater to modern customer preferences is also a strong motivator. Additionally, institutional pressure from the government and evolving social norms, in which digital payments are becoming increasingly common, encourage MSMEs to adapt. (Firstian Aldhi et al., 2024; Nurqamarani et al., 2024). On the other hand, MSMEs face perceived security risks and a lack of trust in digital platforms, which are significant psychological barriers. Initial costs for hardware (e.g., smartphones) and software, although decreasing, are still a consideration for micro-enterprises. However, most crucial for this study are the persistent digital infrastructure gaps in some areas and, more importantly, the low level of digital literacy among MSME owners and employees (Munthe et al., 2024).

Human Resource Competence (HRC)

This contextualization validates the need for a model that can explain these complexities, particularly the role of human capabilities. This section forms the theoretical core of this paper, where we build the argument for our moderator variable, Human Resource Competence (HRC). Human Capital as a digital capability suggests that investment in education, skills, and knowledge is crucial for economic productivity. (Hansen et al., 2025; Purnawan et al., 2025). In the era of Industry 4.0, the concept of human capital is increasingly synonymous with digital capability. Technological tools should be viewed as enhancements to, rather than replacements for, a proficient workforce; indeed, skilled labor is essential for the successful integration and operation of new technologies. According to Ingsih et al., (2024) Human capital serves a purpose beyond that of a traditional production input, as it enables the identification, assessment, and deployment of innovative production methods. As a Key Competence in this research, HRC is framed as a construct heavily influenced by digital literacy. The literature (Campanella, 2023) firmly states that low digital literacy is a major obstacle to the digitalization of MSMEs. Conversely, higher digital literacy enables MSMEs to move from basic use to the strategic integration of technology for marketing, operations, and innovation. (Triandini, 2023). This capability enables them to transform transaction data into smart business decisions, a key benefit of digital payment systems. (Anshari, 2025).

Digital Payment Adoption (DPA)

The importance of HRC is amplified in the context of MSMEs due to their unique characteristics, such as resource constraints, reliance on generalist rather than specialist labor, and informal strategic planning processes. (Mas'ud & Tenriyola, 2025). In such an environment, the team's competence is not just a moderating factor but often the primary determinant of the success or failure of any new initiative, including technology adoption. A diverse array of contextual determinants shapes MSMEs' decisions to adopt digital payment methods. Previous research highlights several catalysts, including operational convenience, transaction speed, and opportunities for cost reduction. (Mediaty et al., 2025). Furthermore, the ability to cater to modern customer preferences and access wider markets serves as a strong motivator, alongside institutional pressure from the government and evolving social norms. (Daryono, D; Dewi, 2024). Conversely, significant psychological and operational barriers persist.

MSMEs often face perceived security risks and a lack of trust in digital platforms. While costs are decreasing, initial costs for hardware, smartphones, and software remain a consideration for micro-enterprises. Most crucially, persistent gaps in digital infrastructure and low levels of digital literacy among owners and employees significantly inhibit adoption. (Gupta et al., 2022). This contextualization underscores the need for a model that accounts for human capabilities in navigating these complexities.

Hypothesis Development

Guided by the theoretical foundations described earlier, the research hypotheses are articulated. The core premise of TAM suggests that technological systems that are simple and user-friendly are more likely to be accepted by users. This logic holds strong for MSMEs, where time and cognitive resources are very limited. An intuitive payment system that requires no extensive training will reduce barriers to adoption. (Long et al., 2023). Individuals will adopt technology they believe will benefit their performance. For MSMEs, these benefits can include increased operational efficiency, reduced cash-handling errors, access to better sales data, and an enhanced image as a modern business. (Purnamasari et al., 2024). This is consistent with previous findings showing a positive relationship between PEU and the adoption of financial technology. (Dhanya et al., 2024; Sutticherchart & Rakthin, 2023; Xavier et al., 2024). When MSME owners perceive digital payments as a useful tool to achieve these business goals, they will be more motivated to adopt them. (Nandru et al., 2024; Rahman et al., 2024; Rana et al., 2025).

The Technology Acceptance Model (TAM) suggests that an individual's choice to adopt a technology is heavily influenced by their assessment of its practical value. For MSMEs, Perceived Usefulness (PU) is defined as the expectation that digital payment tools will improve organizational outcomes by optimizing transaction workflows, expanding market reach, and reducing operational errors. When MSME operators perceive that digital systems offer tangible benefits for achieving their business goals, they are more motivated to adopt them. Therefore, it is proposed:

H_1: Perceived Usefulness has a positive and significant effect on Digital Payment Adoption.

The extent to which users believe a system can be operated without strenuous effort is a vital factor in its overall acceptance. For MSMEs with limited time and cognitive resources, an intuitive, simple payment interface reduces significant barriers to adoption. Systems that are easy to understand and operate are more likely to be integrated into daily business workflows. Consequently, we hypothesize:

H_2: Perceived Ease of Use has a positive and significant effect on Digital Payment Adoption.

Additionally, the link between technological features and adoption behavior is not independent but is shaped by users' specific abilities. Specifically, the impact of ease of use on adoption may be moderated by individual competence. On the one hand, high competence can enable users to overcome the challenges of a less intuitive system, thereby reducing the importance of PEU. (Pandey & Kushwaha, 2025; M. S. Sun & Li, 2024). However, a positive interaction is hypothesized, as competent users are better able to explore and master even easy-to-use systems. In line with previous findings (Alqudah et al., 2025; Dimitrova, 2024)It is stated that MSMEs can discover advanced features, integrate them more deeply into their workflows, and thus amplify the positive impact of the system's ease of use. Digital payment systems are not inherently useful but are actualized by competent users. MSME actors with employees who have low competence may see the system's utility as merely accepting payments (Prabhakaran & L., 2023).

Conversely, employees with high competence will see the same system as a valuable source of sales data for business intelligence, customer trend analysis, and inventory management. Therefore, greater competence enables MSMEs to extract more value from the system, which in turn strengthens their motivation to adopt and use it more extensively. This moderation hypothesis implies that Human Resource Competence acts as a multiplier for the Return on Digital Investment for MSMEs (Manrai et al., 2021). Perceived Usefulness (PU) represents the potential value that a technology can create. The adoption decision is a step to capture that potential value. This is because they are better prepared to convert that potential usefulness into actual business value, for example, higher sales, better efficiency, and new market insights. (Schiuma et al., 2024). Higher competence levels allow MSMEs to extract greater value from the system, thereby strengthening the link between perceived usefulness and the decision to adopt. Thus, the following hypothesis is formulated:

H_3: Human Resource Competence positively moderates the relationship between Perceived Usefulness and Digital Payment Adoption.

Competent users are better equipped to explore advanced features and master even simple systems, integrating them more deeply into organizational processes. For MSMEs with greater human resource competence (HRC), the benefits of a system's user-friendliness are amplified, as the workforce is better equipped to leverage its intuitive features. Consequently, HRC transcends its role as an adoption enabler to become a key driver of the financial and operational gains derived from digital payment integration. Therefore, it is proposed:

H_4: Human Resource Competence positively moderates the relationship between Perceived Ease of Use and Digital Payment Adoption.

Building upon the formulated hypotheses, this research adopts a confirmatory quantitative methodology to test the proposed relationships. The theoretical model illustrating the interactions among the studied variables is presented in Figure 1.

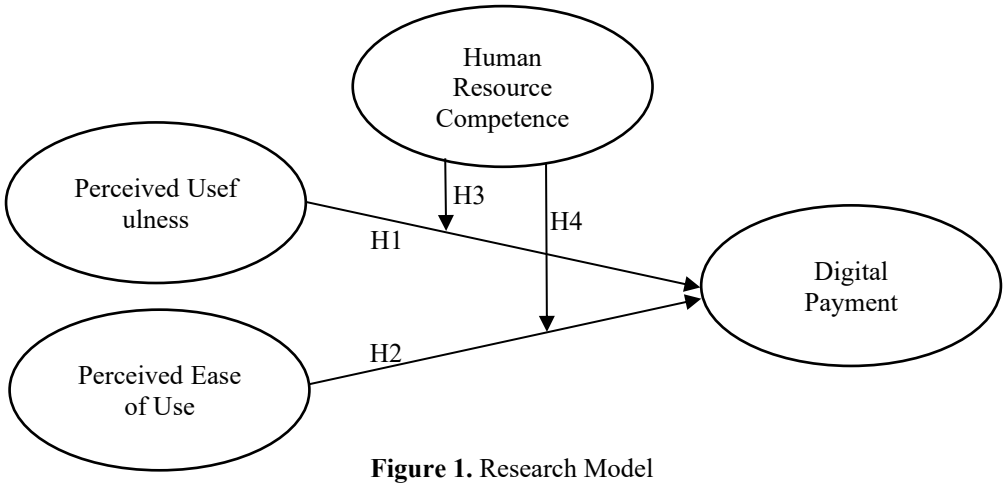


Figure 1. Research Model

METHOD

The research utilized a quantitative framework with a cross-sectional survey methodology. This approach was deemed ideal for evaluating the hypothesized interactions at a specific time point, aligning with established practices in TAM-based studies. The unit of analysis in this study is the individual MSME. Data collection was carried out through structured questionnaires categorized into two main parts: (1) a demographic profile covering respondent and firm attributes; and (2) multi-item measurement scales derived from validated literature, utilizing a five-point Likert scale. The details are as follows: The measurement of perceived usefulness (PU) involved five indicators adapted from Davis (1989), emphasizing the system's role in productivity and job performance. Similarly, perceived ease of use (PEU) was assessed using five items based on de Camargo Fiorini & Jabbour (2017), assessing perceptions of clarity, ease of understanding, requiring little effort, and ease of operating the digital payment system. The moderating variable, Human Resource Competence (HRC), was measured with 5 items adapted from the competency framework of Mitchelmore & Rowley (2010), assessing the level of relevant knowledge (e.g., digital finance), skills (e.g., operating applications), self-concept (e.g., confidence with technology), personal characteristics (e.g., adaptability), and motives (e.g., the drive to learn new technology) within the company. Digital Payment Adoption (DPA), as the dependent variable, was measured as actual usage rather than behavioral intention to provide a more robust test.

The adoption metrics followed. Venkatesh et al., (2003), evaluating transaction frequency and platform variety (e.g., QRIS and mobile banking). The study targeted MSMEs in West Sulawesi, Indonesia, selecting a purposive sample of 250 enterprises aware of digital transaction systems. A purposive sampling technique was used to ensure that all respondents had a basic level of exposure to or awareness of digital payment systems. Including MSMEs that are completely unexposed would yield meaningless data for the core constructs. The inclusion criteria were: (1) having been in operation for at least one year, (2) adopting a digital-based payment system for business transactions, and (3) having a business bank account, which implies a minimal level of financial formalization. The final sample consisted of 250 MSMEs operating in West Sulawesi. This sample size was determined and validated for a structural model with three predictors, a standard power of 0.95, and an alpha level of 0.05; the minimum required sample was 119. Thus, our 250 respondents provide robust statistical power for the PLS-SEM analysis. To ensure data integrity, we implemented two rigorous screening questions: (1) Does your business currently use any form of digital payment? Furthermore, (2) Are you the primary decision-maker?. Furthermore, data cleaning involved a standard deviation check to identify and remove 'straight-lining' responses, where any case with an SD < 0.25 across Likert items was excluded to maintain variance quality. (Hair et al., 2019). This data collection strategy aimed for high participation rates while allowing for real-time clarification. All procedures adhered to ethical standards, including voluntary participation and respondent anonymity.

Empirical data analysis was conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique with the SmartPLS 4 platform. This approach is particularly advantageous for datasets that may deviate from normal distributions and remains effective for moderating analyses in the presence of structural complexity. To address potential Common Method Bias (CMB) arising from the survey's self-reported nature, we conducted a full collinearity test as a proactive methodological safeguard. The resulting Variance Inflation Factors

(VIF) for all constructs were well below the 3.3 threshold. This confirms that the data is free from CMB issues and pathological collinearity, ensuring the structural relationships reported are not inflated by the measurement method; and (4) it is highly effective in handling complex models that include interaction terms, such as the moderating effect of HRC in our framework (Hair et al., 2019). To ensure the structural integrity of each construct, initial tests focused on internal consistency and accuracy. This involved a comprehensive evaluation of factor loadings, Cronbach's alpha, and composite reliability (CR). Furthermore, convergent and discriminant validity were rigorously established through the analysis of Average Variance Extracted (AVE), the Fornell-Larcker criterion, and the Heterotrait-Monotrait (HTMT) ratio. This stage involves examining the coefficients (β), statistical significance (t-statistics and p-values), and the model's predictive power (R^2 for the dependent variable). The moderating effect was tested using the product indicator approach.

RESULT

Demographic Profile

This section presents the empirical findings from the PLS-SEM analysis in a clear and organized manner, using tables to enhance readability. A descriptive summary of the research sample is presented to provide context for the findings. Table 1 summarizes the characteristics of the respondents and their companies, which is crucial for assessing the generalizability of the results.

Table 1. Respondent Profile

Description	Characteristic	Frequency	Percentage (%)
Gender	Male	155	62.0
	Female	95	38.0
Age	30-35	60	24.0
	36-40	112	44.8
	41-60	78	31.2
Length of Business	< 2	50	20.0
	3-5	138	55.2
	> 6	62	24.8
Business location	Urban	195	78.0
	Rural	55	22.0
Entrepreneurship experience	2 >	70	28.0
	3-6	120	48.0
	6 >	60	24.0
Adopting a digital payment system	Yes	243	97.2
	No	7	2.8

The demographic profile of the 250 MSME respondents in West Sulawesi provides critical context for the research findings. As detailed in Table 1, the distribution shows that male entrepreneurs predominate, accounting for 62.0% of the sample, while female entrepreneurs represent 38.0%. In terms of age, the largest segment falls within the 36–40 age bracket (44.8%), indicating that the majority of digital payment users in this region are mature business actors who are likely in a stable phase of their entrepreneurial lifecycle. The business characteristics further underscore the maturity of the participating MSMEs. Over half of the businesses (55.2%) have been in operation for 3 to 5 years, and 48.0% of the owners possess 3 to 6 years of entrepreneurial experience. Geographically, there is a significant concentration in urban areas (78.0%), which aligns with the higher availability of digital infrastructure in regional economic centers. Most notably, the data reveals a high baseline of digital integration, with 97.2% of respondents already adopting digital payment systems. This background suggests that the sample consists of relatively established business actors who are not only familiar with digital technology but are also actively seeking to optimize their operations through financial technology. Since data were derived from self-reported surveys by MSME managers, the potential for Common Method Bias (CMB) was addressed through a comprehensive collinearity check. To ensure the integrity of the findings, we conducted a full collinearity VIF test, which is considered more robust and stringent for PLS-SEM models than the traditional Harman's single-factor test. This procedure involves checking the VIF values for all latent constructs in the structural model to detect any pathological collinearity that might indicate bias.

Table 2. Collinearity VIF Results

Variable	VIF Value
Perceived Usefulness (PU)	2.124
Perceived Ease of Use (PEU)	2.058
Human Resource Competence (HRC)	1.884

Variable	VIF Value
Digital Payment Adoption (DPA)	2.241

As demonstrated in Table 2, the VIF values for all constructs are significantly below the conservative threshold of 3.3. These results confirm that the measurement model is not contaminated by common method bias, and the variance observed in the data is a true representation of the respondents' perceptions rather than an artifact of the measurement method. Consequently, the dataset is verified to have high integrity and is suitable for subsequent measurement and structural model assessments.

Measurement Model Assessment

This section presents evidence of the quality of the measurement instruments used. The analysis shows that the measurement model meets strict standards of reliability and validity. Convergent Validity and Reliability: All loading factor values for each indicator exceed the recommended threshold of 0.70. These results confirm that each set of indicators reliably and consistently measures the same latent construct (Hair et al., 2020).

Table 3. Convergent Validity and Reliability

Construct	Item	Convergent Validity		Reliability	
		Loading Factor	AVE	Cronbach's Alpha	Rho_C
Perceived Usefulness (PU)	PU1	0.83	0.71	0.91	0.92
	PU2	0.85			
	PU3	0.88			
	PU4	0.84			
	PU5	0.82			
Perceived Ease of Use (PEU)	PEU1	0.78	0.74	0.88	0.89
	PEU2	0.80			
	PEU3	0.79			
	PEU4	0.81			
	PEU5	0.77			
Human Resource Competence (HRC)	HRC1	0.86	0.74	0.93	0.93
	HRC2	0.88			
	HRC3	0.87			
	HRC4	0.85			
	HRC5	0.85			
Digital Payment Adoption (DPA)	DPA1	0.85	0.73	0.92	0.93
	DPA2	0.86			
	DPA3	0.85			
	DPA4	0.87			
	DPA5	0.84			

The assessment of the measurement model, as presented in Table 3, demonstrates that all constructs meet the stringent reliability and validity standards required for structural equation modeling. Convergent validity is confirmed, as all indicator factor loadings significantly exceed the recommended threshold of 0.70. Additionally, the AVE values for all latent variables, PU (0.71), PEU (0.74), HRC (0.74), and DPA (0.73), are well above the 0.50 benchmark. The reliability of the constructs is further evidenced by Cronbach's Alpha and Composite Reliability values, both substantially above 0.70. Next, a discriminant validity test was conducted using two methods to ensure that each construct is conceptually distinct from the others (Hair et al., 2020). First, the Fornell-Larcker criterion was met, where the square root of the AVE of each construct (the diagonal values in Table 3) is higher than its correlation with other constructs. Second, all HTMT ratio values were below the conservative threshold of 0.85, further strengthening the discriminant validity.

Table 4. Discriminant Validity Fornell-Larcker Criteria

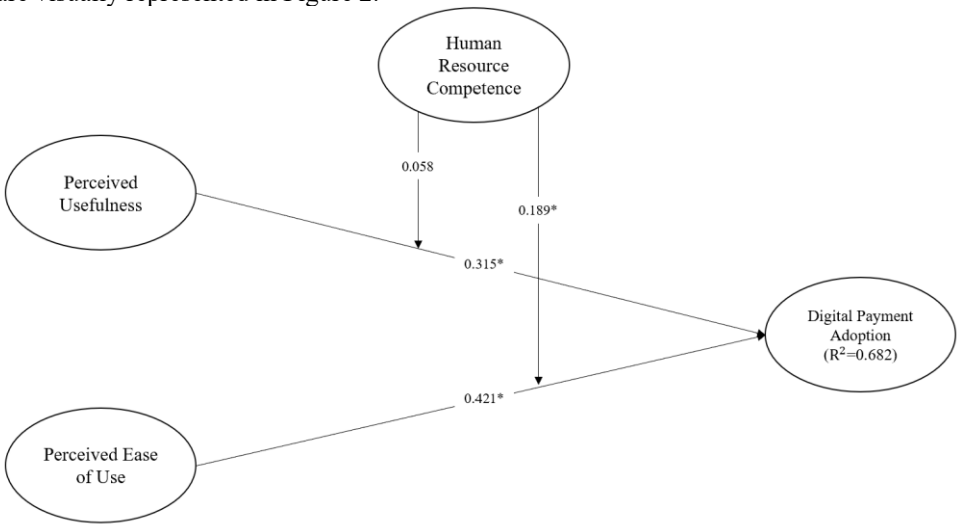
Construct	Fornell–Larcker			
	PU	PEU	HRC	DPA
Perceived Usefulness (PU)	0.855			
Perceived Ease of Use (PEU)	0.778	0.863		
Human Resource Competence (HRC)	0.712	0.699	0.792	
Digital Payment Adoption (DPA)	0.754	0.751	0.688	0.845

This study employed two complementary methods: the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. As demonstrated in Table 4, the Fornell-Larcker criterion is fully satisfied; the values

for Perceived Usefulness (0.855), Perceived Ease of Use (0.863), Human Resource Competence (0.792), and Digital Payment Adoption (0.845) all exceed their respective inter-construct correlations. These combined results confirm that the measurement model possesses strong discriminant validity, thereby providing a valid foundation for testing the structural relationships and the proposed moderation effects.

Structural Model Assessment

Confirming the validity and reliability of the measurement instruments, the research proceeded to examine the hypothesized structural paths. This phase involved analyzing path coefficients *(β)*, assessing statistical significance via *t*-values and *p*-values, and determining the model's predictive accuracy through the PLSpredict protocol. The structural model exhibits robust explanatory capability. Specifically, the coefficient of determination (R^2) for the endogenous construct, Digital Payment Adoption (DPA), reached 0.682. This indicates that the combination of Perceived Usefulness (PU), Perceived Ease of Use (PEU), Human Resource Competence (HRC), and their interaction terms accounts for 68.2% of the variance in adoption behavior. These structural relationships are visually represented in Figure 2.



*) Significant at p<0.05

Figure 2. PLS Structural Model

The analysis results support H1 and H2, which are accepted. There is a positive and significant effect of Perceived Usefulness (PU) on Digital Payment Adoption (DPA) (β = 0.315, t = 4.882, p < 0.001). Similarly, Perceived Ease of Use (PEU) was found to have a positive and significant effect on DPA (β = 0.421, t = 6.109, p < 0.001). Moderating Effects: For testing moderation effects, the results of the moderation analysis are central to this study. Hypothesis 3, which states that Human Resource Competence (HRC) moderates the PU -> DPA relationship, is not supported (β = 0.058, t = 0.912, p = 0.362). However, Hypothesis 4 is strongly supported and accepted. There is a positive and significant moderating effect of Human Resource Competence (HRC) on the relationship between PEU and DPA (β = 0.189, t = 3.541, p < 0.001). The model demonstrates substantial predictive power, with a coefficient of determination (R^2) of 0.682 for the endogenous variable, Digital Payment Adoption (DPA). This means that PU, PEU, HRC, and the interaction DPA can explain 68.2% of the variance in digital payment adoption.

Table 5. Structural Model Results and Hypothesis Testing

Hypothesis testing	Path of Hypothesis	Std. B	T-Statistics	P Values	Result
H_1	PU -> DPA	0.315	4.882	0.001	Supported
H_2	PEU -> DPA	0.421	6.109	0.001	Supported
H_3	HRC * PU -> DPA	0.058	0.912	0.362	Not Supported
H_4	HRC * PEU -> DPA	0.189	3.541	0.001	Supported

Note: significant at <0.05 level, PU = perceived usefulness; PEU = Perceived ease of use; HRC = Human Resource Competence; DPA = Digital Payment Adoption.

The empirical results presented in Table 5 provide the basis for evaluating the proposed structural model and the corresponding hypotheses. The results substantiate that TAM's core constructs are vital drivers of digital adoption in West Sulawesi. Specifically, PU had a significant positive effect on adoption (H1), whereas PEU had an even more pronounced effect (H2). Following the validation of measurement scales, the structural model evaluated the hypothesized paths. These findings imply that the adoption of digital payment systems is driven by

the MSME actors' belief in the system's utility for business performance. The analyses of Moderating Effects (H3 and H4), the role of Human Resource Competence (HRC), and the results differ. Hypothesis 3, which proposed that HRC moderates the relationship between PU and DPA, is not supported. This indicates that the perceived utility of digital payments is universally shared among MSME actors, regardless of their internal competence levels. In contrast, hypothesis 4 is strongly supported, revealing a positive and significant moderating effect of HRC on the relationship between PEU and DPA. The Simple Slope Analysis for H4 reveals that the relationship between PEU and DPA is significantly stronger for MSMEs with high HRC (steeper gradient) compared to those with low HRC (flatter gradient). This confirms that while ease of use is important, its impact on adoption is maximized only when the workforce possesses the competence to utilize the technology effectively.

Table 6. Explanatory Power (R^2) and Predictive Relevance (Q^2)

Endogenous Construct	R^2	Q^2
Digital Payment Adoption (DPA)	0.682	0.415

This result demonstrates that the impact of a system's ease of use on actual adoption is significantly amplified when the MSME possesses high levels of human resource competence. The structural model demonstrates substantial explanatory power, as shown in Table 6; the R2 value for the endogenous construct, Digital Payment Adoption (DPA), is 0.682. This indicates that 68.2% of the variance in digital payment adoption is explained by Perceived Usefulness, Perceived Ease of Use, Human Resource Competence, and their interaction terms. Furthermore, to assess the model's predictive power beyond the sample, the PLSpredict algorithm was applied. The results yielded a Q2 value of 0.415, which is substantially above zero, confirming that the model has strong predictive relevance for the endogenous construct's indicators.

DISCUSSION

This section advances beyond empirical reporting to synthesize the research findings within the broader academic discourse on technology adoption in emerging economies. By evaluating the interplay between technological perceptions and human resource capabilities, this study offers a refined socio-technical perspective on MSME digitalization.

The Effect of Perceived Usefulness on Digital Payment Adoption

The analysis provides strong support for H1, confirming that even in the context of West Sulawesi Province, the fundamental principles of TAM remain valid. MSMEs are rational actors who tend to adopt technologies they find useful for their business. In the context of MSMEs in West Sulawesi Province, Indonesia, the belief is that digital payments can increase efficiency, expand market reach, or boost sales. This evidence corroborates a substantial body of literature identifying perceived utility as a fundamental driver of technological acceptance in the fintech sector. (Asmara et al., 2023; Firstian Aldhi et al., 2024; Gupta et al., 2022). Consequently, the Technology Acceptance Model (TAM) is reaffirmed as a robust explanatory lens for digital commerce behaviors, particularly given the confirmed positive influence of utility perceptions on the motivation to utilize digital platforms, and emphasized utility as a non-negotiable prerequisite for technology acceptance. (Aditya & Wardhana, 2016).

Furthermore, the even stronger impact of PEU highlights the resource-poor nature of small enterprises, where cognitive bandwidth and time are limited. The intuitive nature of systems like QRIS serves as a critical entry point, reducing psychological barriers. Consistent with (Wilson et al., 2021) These results suggest that in developing contexts, the effort-free perception of a system is often more deterministic than its sophisticated features. In the context of national digitalization, this implies that providing useful tools is insufficient without an effort-free user experience. This foundational layer sets the stage for the moderating role of competence, as the potential utility identified here can be fully realized only through the workforce's intellectual capacity.

The Effect of Perceived Ease of Use on Digital Payment Adoption

Strong support for H2 affirms the central role of ease of use in the adopted system. This confirms that a user-centered system design that emphasizes ease is a critical prerequisite for encouraging technology adoption among MSMEs. These results provide a theoretical basis for understanding how perceived ease of use affects acceptance of digital payments in business transactions (Wilson et al., 2021). The ease with which MSME actors use digital payment systems indicates a positive correlation between PEU and DPA (Munthe et al., 2024; Nurqamarani et al., 2024; Usman et al., 2024). Furthermore, the ease of digital payments is growing, encouraging MSMEs to adapt. These outcomes are highly congruent with the core tenets of TAM, which theorize that the likelihood of user acceptance is fundamentally driven by the perception that a technology can be navigated with minimal physical or mental exertion.

In contrast to the findings of Prabhakaran & L., (2023) which states that in mature markets, PEU loses relevance to digital payments; this study finds the opposite to be true. In the context of developing markets, PEU remains a crucial variable due to the digital literacy gap. The interpretation of this phenomenon is that ease of navigation serves as a risk mitigation instrument. Users tend to associate complex interfaces with the risk of transaction errors. Therefore, this research offers a significant theoretical advancement to the Technology Acceptance Model (TAM) by highlighting that within the digital payment landscape, user-friendliness extends beyond mere functional utility. Instead, it operates as a fundamental, intuitive mechanism for cultivating trust, which is particularly critical in emerging fintech environments where perceived complexity is often equated with transaction risk.

The Moderating Role of HRC on the Relationship between PU and DPA

The lack of support for H3, namely HRC, in moderating the PU-DPA relationship indicates that current digital payment systems, such as those based on QRIS and E-Wallets, have reached a sufficiently high level of system trust. The interface is already very intuitive (e.g., scan and pay), so variations in user competence no longer significantly affect the impact of trust on system use. In other words, the system is already trusted by almost everyone to maximize their performance, so additional competence does not provide a significant strengthening effect on this path. (Chong & Zainal, 2024). This finding is supported by research showing that HR competence was not a significant moderator in the context of a well-designed, user-friendly information system. (Manrai et al., 2021; Schiuma et al., 2024). Thus, while PU provides the motivation, the high level of existing system utility and trust means that additional competence does not alter the strength of this specific relationship. This answers why functional utility does not always lead to mass adoption: the key factor is the cultural context of the organization/environment.

Theoretically, HRC, which emphasizes moral support, openness, and collaboration, creates an environment where the benefits of technology, such as efficiency and speed, are collectively validated. While previous studies such as (Ingsih et al., 2024) While PU is often viewed as an individualistic motivation, this study argues that in an environment with strong HRC, the usefulness of technology is socially amplified. This means that a digital payment tool is considered highly useful not only because of its technical features, but also because of the surrounding environment, such as supportive coworkers who respond positively to its efficiency. This contribution adds a new nuance to the literature on change management: the usefulness of technology is contingent on the human relations climate in which it is used. This contribution adds a new nuance to the literature on change management: the usefulness of technology is contingent on the human relations climate in which it is implemented.

The Moderating Role of HRC on the Relationship between PEU and DPA

The most notable finding in this study is the moderating role of HRC in the relationship between PEU and adoption. Interestingly, these results make a unique contribution by explaining that in cultures that prioritize human relations, technical barriers can be minimized through informal social support. This finding can be interpreted as HRC functioning as a crucial activation mechanism. While a digital payment system has latent utility, such as providing sales data, this potential is only activated and transformed into tangible benefits by competent human resources who can analyze data and make strategic decisions based on those insights. (Nandru et al., 2024). High competence enables users to transform technology investment from a mere operational cost into a strategic growth driver, allowing them to explore advanced features and integrate them more deeply into their workflows. Prabhakaran & L. (2023). This is consistent with previous research indicating that when MSME owners view digital payments as a useful tool and possess the necessary capabilities, they are more motivated to adopt them widely. (Rahman et al., 2024; M. S. Sun & Li, 2024). Contrary to the study by (Manrai et al., 2021), which states that ease of use is technical-individual in nature, our results describe HRC as acting as a buffer. In environments with high HRC, if a digital payment system is perceived as difficult to use, human interaction will naturally reduce these barriers. Thus, these findings explain that system designers should not only focus on UI/UX, but also consider how the system can be integrated into a collaborative culture. Our results suggest that PEU does not exist in a vacuum; its effectiveness in driving adoption depends heavily on how much local culture facilitates knowledge transfer among users.

The significance of HRC as a moderator provides a data-based explanation for the gap between policy and the reality of digital adoption in Indonesia. These findings provide a significant theoretical contribution by integrating HRC as a moderating variable, thereby extending the TAM framework beyond its traditional focus on purely technical attributes into a holistic socio-technical perspective. Empirically, this validates claims that low digital literacy is a major obstacle; government programs that only encourage technology provision without simultaneously building human capacity are destined to yield suboptimal results. Encouraging MSMEs to "go digital" without equipping them with the competence to thrive is like giving them a boat without oars; they may be in the water, but they will not go far. At the managerial level, adoption must be viewed as a strategic investment in human capital rather than a mere technical upgrade. Finally, this study advocates a policy paradigm shift toward

a human-centered digitalization strategy, in which digitalization packages integrate access to technology with training in digital literacy and cybersecurity awareness to ensure that national digitalization targets are met through meaningful and sustainable use.

CONCLUSION

This investigation sought to map the primary catalysts for electronic payment integration among small enterprises in West Sulawesi, specifically examining how system characteristics interact with individual capabilities. Our empirical data confirms that perceived utility and ease of use remain foundational drivers, consistent with the core principles of the Technology Acceptance Model. By successfully validating Human Resource Competence (HRC) as a moderating factor, this study responds to the academic demand for adoption frameworks that emphasize organizational and human-centric contexts. A pivotal takeaway from this research is HRC's role in identifying a critical mechanism in the adoption process. This reinforces the perspective that digital transformation is not merely a technical shift but a socio-technical evolution in which human expertise must align with technological potential. Conclusively, while intuitive design may facilitate initial interest, human capital competence determines how effectively MSMEs can leverage these tools for strategic gain.

Therefore, there needs to be a shift from a technology-centered digitalization strategy to a human-centered one. Digitalization support packages for MSMEs must integrate access to technology with training in digital literacy, basic financial management, and data analysis. This research is characterized by several constraints, including the use of cross-sectional data, which precludes causal inference, and a geographical focus on a single province in West Sulawesi, which may limit generalizability to Indonesia as a whole. Based on these limitations, we propose several avenues for future research: (1) longitudinal studies to track adoption patterns and the impact of HRC over time; (2) comparative analyses across diverse regions to assess model stability; (3) including other potentially relevant variables such as perceived security, government support, and competitive pressure; and (4) using multi-level models to differentiate between owner-level and user-level competence.

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