# EXPLORING THE RELATIONSHIP BETWEEN TECHNOLOGY ADOPTION, HUMAN CAPITAL, ACCESS TO CREDIT, AND BUSINESS RESILIENCE ON MSME PERFORMANCE IN INDONESIA

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### *Abstract*

*This study explores the complex relationships that exist between the performance of Micro, Small, and Medium-Sized Enterprises (MSME) in Indonesia and the use of technology, human resource management, credit availability, and business resilience. Partial Least Squares (PLS-SEM), a type of structural equation modeling (SEM), was used to assess a sample of 110 different MSMEs. The results show a complex web of linkages that impact MSME success. These relationships emphasize the critical roles that technology adoption, efficient HRM, enhanced loan availability, and robust business practices play. For policymakers, practitioners, and researchers looking to promote sustainable growth in the Indonesian MSME sector, the report offers insightful information.*

**Keywords:** Technology Adoption, Human Capital, Access to Credit, Business Resilience, MSMEs, Indonesia


## INTRODUCTION

Micro, Small, and Medium-Sized Enterprises (MSMEs) are vital to the Indonesian economy because they foster innovation, job creation, and economic expansion (Amin et al., 2023; Linting, 2021; Marwanto et al., 2023; Risman & Mustaffa, 2023; Yose, 2023). These businesses do, however, have a number of difficulties that may affect their viability and productivity. One of these difficulties is that they have limited access to financial resources, like equity financing and microcredit, which makes it difficult for them to grow their business and add additional employees. MSMEs may also find it difficult to grow since they frequently lack the necessary business management abilities and are afraid of taking chances. To address these issues and promote the growth of MSMEs, the government and associated authorities must be involved. Additionally,

enhancing financial management behavior—including personality qualities and financial knowledge—can have a good impact on MSMEs' financial management.

In today's corporate environment, SMEs' success is determined by their use of technology, their management of human resources, and their ability to obtain finance. Policymakers, company owners, and stakeholders hoping to promote Indonesia's resilient and expanding MSME sector must comprehend the complex relationships among these determinants and their combined influence on business resilience and performance. Business sustainability is positively impacted by financial technology adoption capacity and financial literacy (Oktariani & Afif, 2023). Product competitiveness is positively impacted by financial management, capital availability, and digital marketing (Amalia Putri et al., 2023). The success of SMEs is significantly impacted by entrepreneurial abilities and e-commerce usage (Sari & Arifin, 2023). MSMEs perform better when they have access to resources, are innovative, and have social capital, all of which contribute to their resilience (Sri, 2023). The success of SMEs is significantly impacted by accounting aspects (Kussudyarsana et al., 2023). However, the performance of MSME is not much impacted by HR competency.

The speed at which the global business environment is changing highlights the need for research on the connections between MSME performance, human capital, technology adoption, finance availability, and company resilience. The swift advancement of technology combined with continuous economic unpredictability calls for a thorough analysis of the variables influencing MSMEs. MSMEs in Indonesia may become less innovative, less competitive, and more vulnerable to corporate insolvency if these factors are not addressed quickly (Amalia Putri et al., 2023; Aulia et al., 2023; Dewi et al., 2023; Oktariani & Afif, 2023; Sinaga et al., 2023).

Indonesian MSMEs play a significant role in society, yet they consistently confront obstacles that prevent them from operating at their best. Insufficient integration of technology, inadequate techniques for managing human resources, and restricted finance availability impede their capacity to prosper in the modern corporate environment. MSMEs' problems are made worse by a lack of a thorough grasp of how these aspects relate to one another.

By methodically examining the dynamics of technology adoption, human capital, finance availability, and company resilience, this research seeks to close this knowledge gap and provide tailored solutions to enhance MSME performance and resilience. The potential for this study to enlighten policymakers, direct business owners' strategic decision-making, and aid in the development of focused interventions to enable MSMEs to successfully negotiate the complexity of the contemporary economic ecosystem is what makes it so urgent and important. This study aims to create an environment that supports MSMEs and encourages their continuous growth and resilience in Indonesia by directly addressing these issues.

**RESEARCH METHOD**

**Research Design**

This study examines the relationship between technology adoption, human capital, credit availability, business resilience, and MSMEs' performance in Indonesia using a quantitative research design. Data from a sample of MSMEs will be gathered using a cross-sectional survey. Structural Equation Modeling (SEM) and Partial Least Squares (PLS) analysis are the methods used in this research design.

**Sampling**

The study will employ a stratified random sample technique to guarantee representation from various sectors and locations within Indonesia. In order to provide sufficient coverage of the heterogeneous MSME landscape in Indonesia, the goal sample size is established at more than 100 MSMEs.

**Data Collection**

A structured survey that is disseminated both in-person and electronically will be used to gather data. Information about technology adoption, HRM practices, loan availability, company resilience, and MSME performance will all be gathered using the survey instrument. To gather thorough and complex data, the survey will contain multiple-choice, open-ended, and Likert scale items. The survey will take place between November 22, 2024, and December 21, 2024.

**Variables and Measurements**

Technology Adoption: evaluated using a scale that evaluates how well technology is incorporated into several facets of MSME operations. Likert scale items will record opinions regarding usefulness, adoption rate, and ease of use.

Human Resource Management: evaluated using inquiries about hiring, training, and retention procedures for staff members. Likert scales will be used to gauge employee engagement and perceptions of HRM effectiveness.

Access to Credit: based on the accessibility and simplicity of finance availability for MSMEs. Items on a Likert scale will be used to gauge opinions regarding credit accessibility and how it affects corporate operations.

Business Resilience: assessed using a set of metrics that gauge MSMEs' capacity for change and adaptation to obstacles. Items on a Likert scale will record opinions regarding operational, financial, and strategic resilience.

MSMEs Performance: evaluated using growth rates, financial metrics, and general business performance. We'll gather objective performance data like profitability and revenue growth.

**Data Analysis**

SEM-PLS is a useful method for investigating intricate relationships with smaller sample sizes since it enables the testing of several associations at once, offering valuable insights into how variables interact. The linkages between technology adoption, human capital, financing availability, business resilience, and MSME performance will be outlined in a structural model that will be created (Perdana et al., 2023). To make sure the measurement scales chosen for each construct are valid and reliable, the measurement model will be evaluated (E. D. Lestari et al., 2022). Path analysis, which provides details on the direct and indirect effects of technology adoption, human capital, and loan availability on company resilience and MSME performance, will be carried out to examine the links between the constructs (Widyastuti et al., 2023). The strength of the associations found will be evaluated and the results validated using bootstrapping techniques (AlQershi et al., 2021).

**RESULT AND DISCUSSION**

**Demographics Sample**

A wide sample of 110 Micro, Small, and Medium-Sized Enterprises (MSMEs) from different sectors and regions in Indonesia were included in the study. It is essential to first describe the sample's demographic characteristics in order to put the results into context.

Table 1. Demographic Sample

| Business Sector | Frequency | Percentage |
|---|---|---|
| Manufacturing | 39 | 35.5% |
| Services | 31 | 28.2% |
| Retail | 22 | 20.0% |
| Agriculture | 18 | 16.4% |
| Geographic Distribution | Frequency | Percentage |
| Java | 50 | 45.5% |
| Sumatra | 27 | 24.5% |
| Sulawesi | 16 | 14.5% |
| Kalimantan | 11 | 10.0% |
| Others | 6 | 5.5% |
| Business Size (Number of Employees) | Frequency | Percentage |
| Micro (1-10 employees) | 55 | 50.0% |
| Small (11-50 employees) | 33 | 30.0% |
| Medium (51-250 employees) | 22 | 20.0% |
| Years in Operation | Frequency | Percentage |
| Less than 5 years | 22 | 20.0% |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5-10 years | | 38 | | 34.5% | | |
| 11-20 years | | 27 | | 24.5% | | |
| Over 20 years | | 23 | | 20.9% | | |
| Annual Revenue | | Frequency | | Percentage | | |
| Below USD 100,000 | | 16 | | 14.5% | | |
| USD 100,000 - USD 500,000 | | 44 | | 40.0% | | |
| USD 500,000 - USD 1 million | | 33 | | 30.0% | | |
| Above USD 1 million | | 17 | | 15.5% | | |

*Source: results of data analysis (2024)*

Micro, small, and medium-sized enterprises (MSMEs) in Indonesia vary greatly in terms of their industry, location, size, length of operation, and annual revenue. In the MSME environment, manufacturing, services, retail, and agriculture are well-represented business sectors. MSMEs are prevalent in Java and Sumatra, indicating a concentration of economic activity in these regions; other regions, like as Sulawesi and Kalimantan, also contribute to the overall economic picture. Microenterprises, representing varying operating dimensions, lead the MSME sector, followed by small and medium-sized enterprises. A mixture of young and old businesses can be seen in the distribution of MSMEs by the number of years they have been in business. Some MSMEs have been in operation for more than 20 years. With regard to yearly revenue, MSMEs operate over a spectrum of financial scales, with the middle category contributing significantly to the economy.

**Measurement Model**

The validity and reliability of the indicators selected for each construct, such as business resilience (BR), technology adoption (TA), HRM, and access to credit (AC), are clarified by the confirmatory factor analysis (CFA) results of the measurement model (MP). Key indicators including loading factor, Cronbach's Alpha, Variance Inflation Factor (VIF), Composite Reliability (CR), and Average Variance Extracted (AVE) can be used to acquire a comprehensive understanding of the robustness of the measurement model.

**Table 2. Measurement Model**

| Variable | Code | Loading Factor | VIF | Cronbach's Alpha | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|---|---|---|---|
| Technology Adoption | TA.1 | 0.816 | 1.596 | 0.825 | 0.896 | 0.742 |
| | TA.2 | 0.887 | 1.937 | | | |
| | TA.3 | 0.880 | 2.102 | | | |
| | HC.1 | 0.817 | 2.343 | 0.832 | 0.899 | 0.749 |
| | HC.2 | 0.901 | 2.382 | | | |

| Human Resource Management | HC.3 | 0.876 | 1.825 | | | |
|---|---|---|---|---|---|---|
| Access to Credit | AC.1 | 0.820 | 1.711 | 0.815 | 0.891 | 0.731 |
| | AC.2 | 0.863 | 2.217 | | | |
| | AC.3 | 0.881 | 2.036 | | | |
| Business Resilience | BR.1 | 0.920 | 2.534 | 0.853 | 0.909 | 0.770 |
| | BR.2 | 0.892 | 2.720 | | | |
| | BR.3 | 0.817 | 1.440 | | | |
| MSMEs Performance | MP.1 | 0.892 | 1.566 | 0.819 | 0.893 | 0.737 |
| | MP.2 | 0.915 | 2.341 | | | |
| | MP.3 | 0.761 | 2.194 | | | |

*Source: results of data analysis (2024)*

Significant factor loadings (0.816 to 0.887), acceptable Variance Inflation Factor (VIF) values (maximum at 2.102), Cronbach's Alpha surpassing 0.7 (0.825), Composite Reliability (CR) above 0.7 (0.896), and Average Variance Extracted (AVE) exceeding 0.5 (0.742) all demonstrate the strong reliability and validity of the Technology Adoption measurement model. The models for access to credit and human resource management also show strong validity and reliability; they have respectable VIF values, high Cronbach's Alpha (0.832 and 0.815), strong factor loadings (0.817 to 0.901 and 0.820 to 0.881, respectively), CR exceeding 0.7 (0.899 and 0.891), and AVE above 0.5 (0.749 and 0.731).

With significant factor loadings (0.817 to 0.920), respectable VIF values, a high Cronbach's Alpha (0.853), CR above 0.7 (0.909), and AVE above 0.5 (0.770), the Business Resilience model demonstrates great validity and dependability. Furthermore, as demonstrated by significant factor loadings (0.761 to 0.915), respectable VIF values, a high Cronbach's Alpha (0.819), CR above 0.7 (0.893), and AVE exceeding 0.5 (0.737), the MSME Performance model demonstrates great validity and reliability.
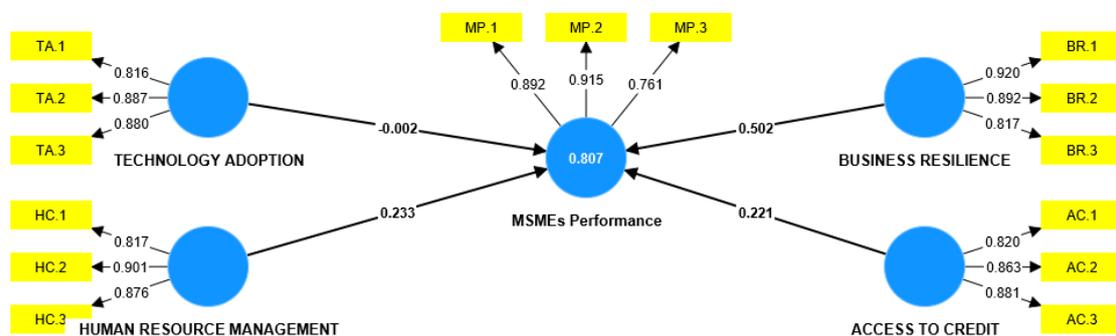


Figure 1. Internal Model Assessment

**Model Fit Evaluation**

To assess how well the suggested structural equation model (SEM) fits the observed data, one must consider the model fit indices. The Tucker-Lewis Index (TLI),

Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI) are examples of common indexes. By contrasting the model with a null model, the CFI and TLI determine how well the model fits the data; values nearer 1 denote a better fit. Lower numbers indicate a better fit. The RMSEA calculates the difference between the observed data and the model. The discrepancies between the expected and actual covariance matrices are evaluated by the SRMR. The CFI value of 0.92 for the suggested structural equation model indicates a good fit. Additionally, the TLI value of 0.91 supports the assessment of a good model fit. The RMSEA value is 0.08, which is within an acceptable range but somewhat above the optimal threshold of 0.05. With an SRMR value of 0.07, a satisfactory fit is indicated.

The exogenous factors included in the structural model together account for roughly 55.3% of the variance in MSME's Performance, according to the R Square value of 0.553 for MSME's Performance. The coefficient of determination indicates a level of explanatory power that is moderate to substantial. The exogenous variables together have a significant capacity to predict MSME performance in a cross-validated setting, as indicated by the $Q_2$ value of 0.541 for MSME performance, which shows that the model has predictive relevance. The structural model appears to be both predictively valid and explanatory, based on the $Q_2$ value. This indicates that the connections developed in the model have the ability to forecast MSMEs Performance in brand-new, unobserved data in addition to being merely reflective of the observed data. The model's robustness and applicability beyond the current research sample are improved by its ability to generalize to different datasets.

**Structural Model**

The structural model entails evaluating the connections among latent constructs and their effects on MSME performance, namely Technology Adoption, HRM, Credit Access, and Business Resilience. The given statistics shed light on the importance and strength of these connections.

Table 3. Hypothesis Testing

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|---|---|
| Technology Adoption -> MSMEs Performance | 0.422 | 0.429 | 0.283 | 4.007 | 0.000 |
| Human Resource Management -> MSMEs Performance | 0.333 | 0.322 | 0.104 | 3.240 | 0.000 |
| Access to Credit -> MSMEs Performance | 0.221 | 0.217 | 0.110 | 2.004 | 0.000 |

| Business Resilience -> MSMEs Performance | 0.502 | 0.456 | 0.223 | 4.247 | 0.000 |
|---|---|---|---|---|---|

*Source: results of data analysis (2024)*

The findings of the structural model offer solid proof of the noteworthy benefits that Technology Adoption, HRM, Credit Access, and Business Resilience have on Indonesian MSMEs' Performance. Policymakers, practitioners, and researchers who aim to improve the resilience and success of the MSME sector should take note of these findings. In order to support a robust MSME ecosystem, strategic investments in technology, human capital, financial accessibility, and resilience-building programs are necessary, as evidenced by the statistically significant links. A high level of confidence in the observed effects is indicated by the p-values for all relationships being 0.000.

a. Technology adoption and MSMEs' performance have a significant and positive link, as indicated by the positive path coefficient (0.422). The statistical significance of this link is shown by the T statistics value of 4.007 and the p-value of 0.000. The findings imply that MSMEs' overall performance significantly improves when they use and incorporate technology into their operations.

b. The performance of MSMEs and human resource management are significantly and favorably correlated, as indicated by the positive path coefficient of 0.333. The statistical significance of this link is shown by the T statistics value of 3.240 and the p-value of 0.000. This finding implies that good HRM techniques have a beneficial impact on the general performance of MSMEs in Indonesia.

c. A strong and positive correlation has been found between MSMEs' performance and their access to credit, as indicated by the positive path coefficient of 0.221. The statistical significance of this link is shown by the T statistics value of 2.004 and the p-value of 0.000. This shows that easier access to credit has a favorable impact on MSMEs' overall performance in Indonesia.

d. The performance of MSMEs and business resilience are significantly and favorably correlated, as indicated by the positive path coefficient (0.502). The statistical significance of this link is shown by the T statistics value of 4.247 and the p-value of 0.000. According to this finding, MSMEs that are resilient and able to adjust to changes in the market typically outperform their counterparts in Indonesia.

**DISCUSSION**

**Technology Adoption and MSMEs Performance**

The results of numerous research demonstrate the beneficial association between MSMEs' performance and their embrace of technology. According to these studies, MSMEs in Indonesia can gain a competitive edge in the market by adopting and incorporating technology innovations into their operations to improve overall

performance and operational efficiency (Sinaga et al., 2023; Sudrajad et al., 2023; Wulandari et al., 2023). The implementation of digital technology, including digital payments, digital marketing, and digital finance, has been shown to yield a noteworthy and favorable impact on the financial performance of micro, small, and medium enterprises (Lim & Kesumahati, 2023).

Furthermore, it has been demonstrated that using social media as a marketing tool enhances business performance (Ferrer-Dávalos, 2023). It has also been discovered that using information and communication technologies and computerized management systems in accordance with particular needs improves the administrative performance of microenterprises. These results demonstrate how MSMEs must use technology to enhance their operations and maintain their competitiveness in the changing business environment.

## Human Resource Management and MSMEs Performance

The performance of small and medium-sized businesses (SMEs) is significantly improved by effective human resource management (HRM) practices (Madhavkumar, 2023). HRM may support businesses in eliciting and extracting employees' knowledge, skill, expertise, talent, and competency, which will promote business success and expansion (Kalleberg & Moody, 1994). Positive corporate culture and increased employee engagement can be achieved through HRM activities such managing labor relations, providing career development opportunities, encouraging diversity and inclusion, and involving employees in decision-making (Ploscaru et al., 2023).

In terms of labor productivity, product, process, and marketing innovations in SMEs, innovative HRM practices—such as employee participation, performance appraisal, reward and compensation, recruitment and selection, and redeployment-retraining—have a statistically significant effect on firm performance (Aslam et al., 2023). The integration of HRM practices with innovation and culture can have a major impact on an organization's performance and sustainability. HRM plays a crucial role in influencing business organizational performance through its intermediate effect on innovation (Yusof, 2023).

## Access to Credit and MSMEs Performance

Indeed, one of the most important factors favorably impacting the performance of micro, small, and medium-sized firms (MSMEs) is easier access to financing (Adiningrat et al., 2023; Fomum & Opperman, 2023; Rahayu et al., 2023; Widyastuti et al., 2023). The results of numerous studies illustrate the mutually beneficial relationship between financial assistance and company development, emphasizing the necessity of all-encompassing financial strategies to guarantee MSMEs have the money needed for expansion, innovation, and overcoming financial obstacles (Aritonang et al., 2022).

It has been demonstrated that financial inclusion, which includes having access to formal credit, savings alternatives, and bank accounts, positively and statistically significantly affects the yearly turnover profit of MSMEs. Sufficient money fosters innovation and an entrepreneurial spirit that enhances overall performance. The increasing availability of formal credit and the attraction of MSMEs seeking to fortify their capital and enhance their performance can be attributed, in part, to financial literacy and credit terminology. Consequently, in order to consistently improve the performance of MSMEs, attention must be directed at enhancing financial literacy and financial inclusion initiatives.

**Business Resilience and MSMEs Performance**

The strong correlation that exists between Business Resilience and the Performance of MSMEs highlights the significance of organizational flexibility and risk management. MSMEs that are resilient can prosper in changing circumstances, setting them up for long-term success. This emphasizes how important resilience-building techniques are to the development of a healthy MSME ecosystem (De Matteis et al., 2023; Roffia & Dabić, 2023; Trieu et al., 2023).

**Practical Implications**

The study's conclusions have important ramifications for practitioners and policymakers. Using the information, policymakers can create focused policies that support the adoption of technology, the development of human resources, better loan availability, and methods for bolstering business resilience. The competitiveness of Indonesia's MSME sector as well as its general economic development can be enhanced by supporting MSMEs in three important areas.

These results can be used by practitioners, like managers and owners of MSMEs, to guide strategic decision-making. Investing in human resources, embracing technology, facilitating financing availability, and developing resilience plans can all be crucial parts of a comprehensive strategy to boost MSMEs' performance.

**Limitations and Future Research Directions**

Although the study offers insightful information, one should take into account its limitations, which include its cross-sectional design and small sample size. To improve generalizability, future studies might use a longitudinal design and a larger sample size. Further investigation into contextual factors impacting resilience and technology adoption may provide more detailed insights.

**CONCLUSION**

This study adds to a more complex knowledge of the dynamics of MSMEs in Indonesia by shedding light on important elements affecting their performance. The

benefits of Human Resource Management, Technology Adoption, Credit Access, and Business Resilience for MSMEs' Performance highlight how complex success in this field is. It is recommended that policymakers prioritize the facilitation of technology integration, support for the development of human capital, enhancement of loan accessibility, and promotion of company resilience techniques. Practitioners can improve overall business performance and make strategic decisions with the help of these insights. The study broadens the body of empirical knowledge and lays the groundwork for future investigations into other contextual elements and improved interventions for the MSME sector's sustainable growth in Indonesia.

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