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Digital Transformation and SME Innovation Performance: Examining the Roles of Financial Inclusion and Financial Health

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ABSTRACT

Digital transformation has become increasingly important for improving the competitiveness and innovation capacity of small and medium-sized enterprises (SMEs). Financial inclusion and financial health may further influence the ability of firms to adopt digital technologies and strengthen innovation performance. A quantitative cross-sectional secondary-data design was used with 175 SMEs. Financial inclusion, financial health, digital transformation, and innovation performance were assessed using multi-item measures. Descriptive statistics, Cronbach's alpha, Spearman correlation, and multiple linear regression were applied to examine associations among the study constructs. Financial inclusion, financial health, and digital transformation were all positively associated with SME innovation performance. Digital transformation showed the strongest relationship with innovation performance and emerged as the largest independent predictor in the regression model. Financial inclusion also made a significant positive contribution, while financial health showed a smaller but statistically significant effect. The combined model explained a substantial proportion of the variation in innovation performance. SME innovation performance was closely linked with both digital and financial conditions. Strengthening digital maturity, improving financial inclusion, and supporting financial stability may enhance firms' capacity to innovate. Future studies should use longitudinal designs and broader samples to clarify causal pathways and strengthen generalizability.

KEYWORDS: Digital transformation; SME innovation; Financial inclusion; Financial health; Digital maturity

1. Introduction

TSmall and medium business ventures (SMEs) have a significant role in employment, entrepreneurship, productivity, and the development of the economy but have limitations in terms of finance, technology, and ability to innovate. Their competitiveness is becoming more and more reliant on effective resource utilization, access to financial services, adaptation to technological changes, and constant innovativeness. Access to finance has been revealed to enhance the performance of the SMEs as firms are able to access funds to expand, invest and improve their operations (Abdallah et al., 2025). It is also possible to enhance SME outcomes with the use of financial innovation, which expands access to the right financial products and mitigates the barriers to traditional financing (Effiom & Edet, 2022). Digital transformation is currently a significant tool of enhancing SME efficiency, responsiveness, and competitiveness. It goes past mere usage of digital tools and encompasses digital maturity, organizational preparedness, and technology incorporated in business processes. Managerial and organizational features that determine the adoption and implementation of technology may lead to the existence of differences in digital transformation in SMEs (Alam et al., 2022). Increased digital transformation has also been linked to better firm performance since digitally proficient SMEs are also able to enhance operations, processing of information and responsiveness to markets (Teng et al., 2022). Digital innovation can also enhance financial performance through more efficient processes and enhanced value creation (Mangifera et al., 2022).

Another critical requirement in the development of SMEs is financial inclusion as it is the factor that defines the access of firms to formal credit, payment, savings and digital financial services. Digital finance access can facilitate the performance of SMEs, especially when the managers possess adequate financial literacy to utilize services offered (Frimpong et al., 2022). Financial inclusion can also be enhanced through financial and digital financial literacy, which enhances the capacity of SMEs to obtain and use modern financial products (Al-Shami et al., 2024). It has been found that digital inclusive finance is linked with an enhanced level of technological innovation activity since better access to finance can mitigate resource limitations to invest in innovation (Gu et al., 2023). It can also serve as a valuable channel by which digital financial capabilities can be used to enhance MSME performance (Tandilino et al., 2025). Financial health refers to the capacity of an enterprise to utilize resources, fulfil obligations, stay afloat and survive the financial strain. Good financial health has the potential to give the ability needed to

invest in digital technologies, innovation, and business growth. Recent data show that improved financial situation can enhance SME resilience and long-term sustainable performance (Babic et al., 2026). Finance and adoption of financial technology can further help in business sustainability by enhancing finances and minimizing operational limitations (Kurniasari et al., 2025). The relationship between financial capability and sustainable firm performance can also be reinforced by the adoption of fintech through greater effectiveness in decision-making in financial contexts (Hidayat-ur-Rehman, 2025).

Digital transformation is also strongly connected to the performance of innovation since digital technologies may enhance the product development, the efficiency of processes, flexibility of an organization and information utilization. The digital transformation and big-data potentials have demonstrated the ability to facilitate SME innovation performance with enhanced technological integration and knowledge use (Hongyun et al., 2025). The adoption of digital technology, the ability to innovate, and financial inclusion can also mutually reinforce the performance of MSMEs, as well as their economic involvement (Khan et al., 2026). Digitalization and innovation have also been related to better post-pandemic SME financial performance (Rosyidiana and Narsa, 2024), and technological adaptation and innovative finance can help to make business more sustainable in the long-term (Pu et al., 2021).

Although they are frequently considered independently, there is increasing evidence to the contrary. Improved SME performance has been connected with financial literacy and digital innovation (Rini et al., 2025), and digital transformation could also collaborate with digital financial inclusion to determine the results of productivity and innovation (Tan et al., 2025). Thus, this research paper explored the concept of financial inclusion, financial health, digital transformation, and SME innovation performance through one framework to make clear the relationship between financial and digital conditions and innovation performance.

Objectives of the Study

- 1.To examine the relationships among financial inclusion, financial health, digital transformation, and SME innovation performance.
- 2.To determine the independent contributions of digital transformation, financial inclusion, and financial health to SME innovation performance.

2. Methodology

2.1 Study Design

The research design was a quantitative cross-sectional secondary-data study to test the connection between digital transformation, financial inclusion, financial health, and SME innovation performance. The design was suitable in the sense that the information was in terms of firm-level observations, which were acquired during a specified study period and had standard measures of the major constructs. The method allowed evaluating the attributes of the constructs, comparing financial and digital states, analyzing the relationships between variables, and estimating the independent effects of financial and digital variables on the performance of innovation.

2.2 Data Source

Data were obtained from the publicly available SMEs_Ecuador_Data repository hosted on Mendeley Data (Espinoza Loayza et al., 2026). This source comprised 175 valid observations out of the micro, small, and medium-sized enterprises in Ecuador and contained data on financial literacy, financial inclusion, financial health, digital maturity, innovation performance, and the selected firm characteristics. It was downloaded in the Mendeley repository and ready to be analyzed with the help of the provided coded indicators and construct-related variables.

2.3 Study Population and Sample

Micro, small and medium-sized enterprises operating in Ecuador formed the research population. A unit of analysis was the individual enterprise. The final sample comprised 175 valid SME observations, which were all retained to be analyzed since they had the necessary information of the main study constructs. No additional sampling procedure was applied. The observed data were a range of variation in financial access, financial condition, digital maturity, and innovation performance, which made it possible to assess substantially the relationships suggested in the analytical framework.

2.4 Study Variables and Measurement

Four major constructs were considered in the analysis. Financial inclusion was also measured by six indicators with the codes of FI1-FI6, whereas financial health was measured with three indicators with codes of FH1-FH3. Digital transformation was reflected with five digital-maturity indicators, which were coded DM1-DM5 and innovation performance was quantified

with six indicators IC1-IC6. Each construct had composite mean scores, with the scores indicating greater degree of financial inclusion, financial health, digital maturity, or innovation performance among the SMEs that participated.

2.5 Data Preparation and Construct Assessment

Information was analyzed with regard to completeness, duplicate records, consistency in coding, and in the valid response ranges. The special values of -999 were considered to be missing or unavailable values instead of real numbers. The corresponding construct items were used to form composite scores in order to retain interpretation on the original response scale. Internal consistency was subsequently assessed through Cronbach's alpha on the financial inclusion, financial health, digital transformation and innovation performance to establish the reliability of each multi-item measure, prior to inferential analysis.

2.6 Statistical Analysis

Descriptive, correlation and regression procedures were used to statistically analyze the data. The major constructs were calculated in terms of means, SD, minimum values, and maximum values. The relationships between financial inclusion, financial health, digital transformation, and innovation performance were analyzed using Spearman rank correlation coefficient. Several linear regressions were then conducted in which the dependent variable was innovation performance and the predictors were digital transformation, financial inclusion and financial health. Regression coefficients, standard errors, confidence intervals, R², adjusted R², F-statistics and p-values were presented with the significance level of $p < 0.05$.

3. Results

3.1 Reliability of the Study Constructs

Financial inclusion, financial health, digital transformation, and innovation performance were looked into in terms of internal consistency. The reliability of financial inclusion, digital transformation, and innovation performance was satisfactory to excellent, implying that their items have good consistency. Internal consistency was relatively low on financial health, implying that results pertaining to this construct should be viewed with a grain of salt. Table 1 shows the reliability coefficients of the four study constructs.

Table 1. Reliability of the Main Study Constructs

Construct	Number of Items	Cronbach's Alpha	Interpretation
Financial Inclusion	6	0.811	Good
Financial Health	3	0.398	Low
Digital Transformation	5	0.902	Excellent
Innovation Performance	6	0.824	Good

Figure 1 shows the number of measurement items that would be used to measure each of the major study constructs.

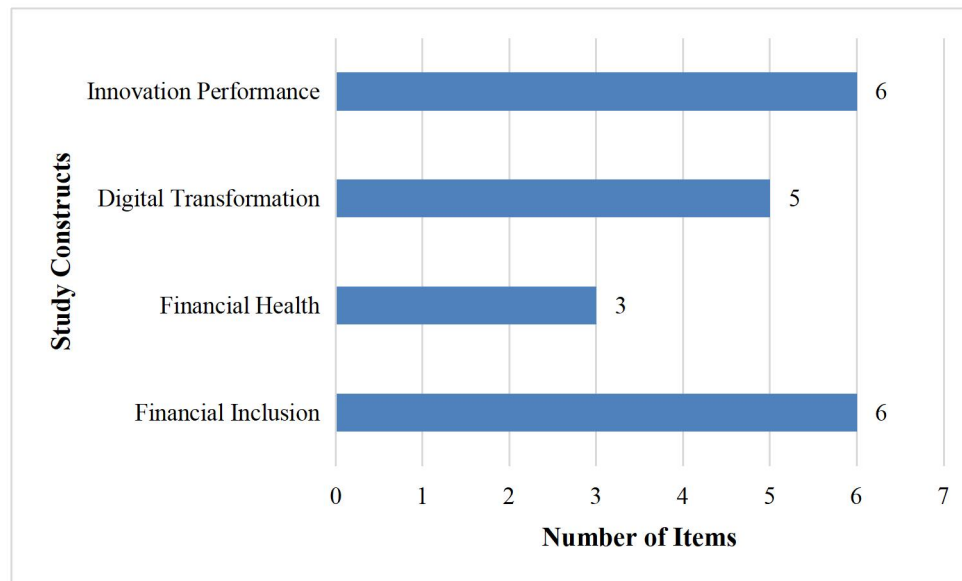


Figure 1. Construct Measurement Items

The difference in the number of items used in the study constructs is presented in Figure 1. The comparatively larger measurement structures took the shape of financial inclusion and innovation performance, and then digital transformation, and the financial health was measured by a shorter scale.

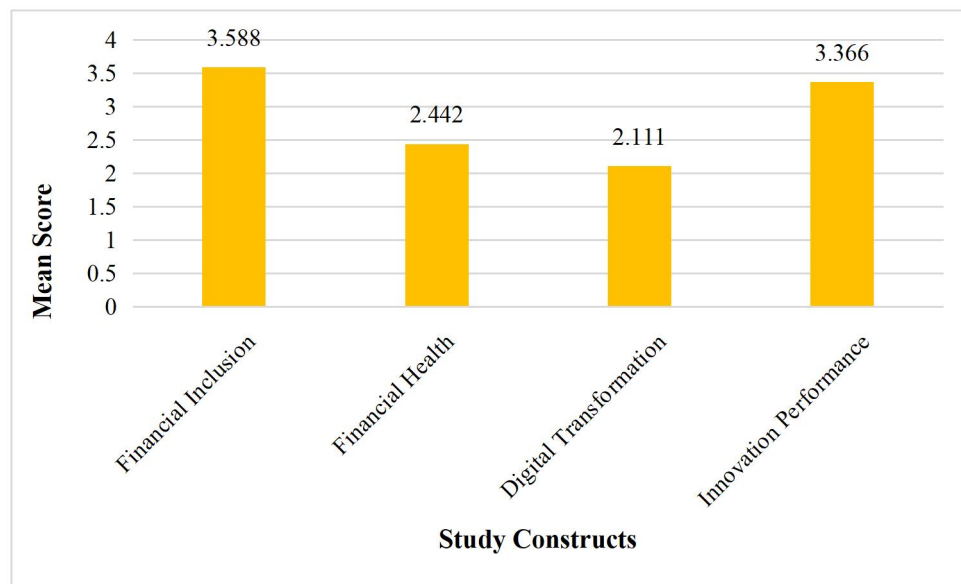
3.2 Descriptive Profile of the Main Constructs

The general rates of financial inclusion, financial health, digital transformation, and innovation performance of the 175 SMEs were summarised using descriptive statistics. The average score in financial inclusion was the highest, as well as innovation performance was rather promising. The financial health was averagely high, and the lowest average score was obtained by digital transformation. The variation that was observed in all the four constructs gave a justifiable point of examining their statistical relationship as depicted in Table 2.

Table 2. Descriptive Statistics of the Main Study Constructs

Construct	N	Mean	SD	Minimum	Maximum
Financial Inclusion	175	3.588	0.618	2.333	5.000
Financial Health	175	2.442	0.677	1.667	4.333
Digital Transformation	175	2.111	0.745	1.000	4.800
Innovation Performance	175	3.366	0.545	2.167	4.833

Figure 2 shows the relative average levels of financial inclusion, financial health, digital transformation, and innovation performance.

**Figure 2. Mean Scores of Main Study Constructs**

It is possible to observe that the average levels of financial inclusion and innovation performance are relatively high, and financial health is moderate, and digital transformation is lower compared to the three indicators, as shown in Figure 2. The trend shows that there are significant variations in the financial, digital and innovation attributes of the involved SMEs.

3.3 Relationships Among Financial, Digital, and Innovation Constructs

Spearman correlation analysis revealed positive and statistically significant associations between all four key constructs. Financial health, digital transformation and innovation performance were positively connected with financial inclusion. It was most related to digital transformation. Digital transformation and innovation performance were also positively related to financial health. Digital transformation showed a high positive correlation with innovation performance,

which means that the more SMEs were already digital, the higher the reported innovation performance. Table 3 shows these associations.

Table 3. Spearman Correlations Among the Main Study Constructs

Variable 1	Variable 2	Spearman's ρ	p-value
Financial Inclusion	Financial Health	0.509	<0.001
Financial Inclusion	Digital Transformation	0.685	<0.001
Financial Inclusion	Innovation Performance	0.592	<0.001
Financial Health	Digital Transformation	0.427	<0.001
Financial Health	Innovation Performance	0.464	<0.001
Digital Transformation	Innovation Performance	0.650	<0.001

3.4 Predictors of SME Innovation Performance

A multiple linear regression was conducted to assess the independent contribution of the digital transformation, financial inclusion, and financial health on SME innovation performance. The model as a whole was significant and accounted a significant percentage of the variability in the performance of innovation. Digital transformation was the most positively contributing factor, then financial inclusion and financial health. The three predictors were all found to be statistically significant after simultaneous adjustment, which means that the two digital and the financial factors were independent of each other, and stronger innovation performance was linked to the two (Table 4).

Table 4. Multiple Linear Regression Predicting SME Innovation Performance

Predictor	B	SE	t	p-value	95% CI
Constant	1.608	0.169	9.493	<0.001	1.274–1.942
Digital Transformation	0.357	0.048	7.380	<0.001	0.262–0.453
Financial Inclusion	0.200	0.073	2.753	0.007	0.057–0.344
Financial Health	0.117	0.056	2.093	0.038	0.007–0.227

3.5 Integrated Financial and Digital Pattern Associated with Innovation

The joint analysis depicted a correlated trend between and among financial inclusion, financial health, digital transformation, and innovation performance. Digital transformation was closely

linked with financial inclusion and had an independent impact on innovation performance. There were moderate positive associations between financial health and digital transformation as well as innovation performance. Digital transformation was the one that showed the most general relationship with innovation performance and the highest regression coefficient. Table 5 summarizes the integrated pattern of financial and digital impacts on the performance of innovation.

Table 5. Integrated Summary of Financial and Digital Factors Associated with SME Innovation Performance

Relationship/Predictor	Association With Relevant Outcome	Regression B	p-value	Overall Finding
Financial Inclusion → Digital Transformation	$\rho = 0.685$	-	<0.001	Strong positive association
Financial Health → Digital Transformation	$\rho = 0.427$	-	<0.001	Moderate positive association
Financial Inclusion → Innovation Performance	$\rho = 0.592$	0.200	0.007	Positive independent contribution
Financial Health → Innovation Performance	$\rho = 0.464$	0.117	0.038	Positive independent contribution
Digital Transformation → Innovation Performance	$\rho = 0.650$	0.357	<0.001	Strongest independent contribution

4. Discussion

The results indicated that the digital transformation, financial inclusion, and financial health had positive relationships with SME innovation performance. Digital transformation was the most correlated with innovation performance, and the most powerful predictor in the regression model. It indicates that SMEs that had a higher level of digital maturity were in a better position to facilitate innovation-related operations, enhance responsiveness, and adopt technology in the business operations. The positive contribution of financial inclusion was also significant, whereas financial health was less but significantly related to innovation performance. Collectively, these findings show that innovation performance was a product of both digital ability and financial situations and not a single factor.

The high connection between innovation performance and digital transformation was in line with the past studies. According to Valdez-Juárez et al. (2024), digital transformation and innovation served as dynamic capabilities to improve the performance of SMEs. In the same way, Wang et al. (2025) discovered that digital inclusive finance facilitated SME innovation by enhancing access to financial and technological resources. These results are consistent with the current finding that more digitally robust firms were more likely to exhibit positive innovation performance. The beneficial impact of financial inclusion was also similar to that of Togun et al. (2022) who discovered that financial inclusion had a positive impact on the performance of SMEs, especially with the support of financial literacy. Similar results were demonstrated by Thathsarani and Jianguo (2022), who also revealed that digital finance and technology acceptance may enhance financial inclusion and SME performance. The practical significance of the witnessed correlation between financial inclusion and digital transformation is also significant. Included SMEs financially can be better positioned to utilize digital payment systems, formal credit, fintech, and other financial products that support the adoption of technology. This meaning aligns with that of Wati (2024), who proposed digital financial services and financial inclusion as key drivers of SME performance. Yu et al. (2023) also demonstrated that digital inclusive finance had the potential to enhance the financial results of SMEs, whereas Zulqarnain et al. (2023) highlighted that technological adaptation enhanced the impact of financial inclusion and digital finance on the performance of the SMEs. These parallels indicate that access to finances and access to technology can collaborate in facilitating business growth.

The implications of the findings in terms of managerial and policy are essential as well. Owners of SMEs are encouraged not to see digital transformation as a simple usage of technology, but rather as an expanded potential that involves access to financial resources, organizational preparedness, and long-term investment. SME innovation can be promoted by financial institutions and policymakers through enhancing access to affordable finance, digital financial services, and capability-building programs. Enhancing financial inclusion could indirectly contribute to digital maturity, and healthier financial situations could enable firms to invest more in innovation. The supporting initiatives must thus incorporate financial, digital and innovation-based interventions instead of focusing on each area individually. There are a number of limitations that should be taken into account. The cross-sectional nature of the study limited the ability to interpret causally, thus the relationships obtained cannot be used to assert that digital transformation or financial variables were the direct cause of the increase in innovation

performance. Self-reported multi-item measures were also used in the study and could be affected by the perception of the respondent. Also, the financial health construct demonstrated rather low internal consistency, which implies that the results regarding this variable should be taken with a grain of salt. It was also analyzed using SMEs in a single national setting and this may not be generalizable to other economic and institutional settings.

The longitudinal designs should be employed in future research to evaluate the role of financial inclusion, financial health, and digital transformation in innovation in the long run. External validity would be enhanced by bigger and more diversified samples in cross-country and cross-sector settings. Mediation or moderation model could also be tested in the future to identify whether digital transformation serves as a channel between financial inclusion and innovation performance or whether firm size, sector or technological readiness alters these relations. Healthy financial health measures should also be taken to enhance future empirical testing.

5. Conclusion

This study examined the relationships among digital transformation, financial inclusion, financial health, and SME innovation performance. The results indicated that the three explanatory factors had a positive relationship with innovation performance, with digital transformation having the strongest relationship and the highest independent contribution in the regression model. The role of financial inclusion was also significant, which suggests that the wider access to financial services can help companies enhance both the digital capacity and the performance of innovation. The contribution of financial health was smaller, but it was statistically significant implying that financial stability can be an extra support to the processes associated with innovation. The results highlight the importance of considering financial and digital factors together when assessing SME innovation. An increase in digital maturity might not be enough when companies are still struggling with financial constraints or poor financial health. SMEs can thus enjoy the integration of coordinated strategies that include the development of digital capabilities, enhanced access to finance, and financial management. This process can be facilitated by financial institutions and policymakers using available financial services, digital finance programs, and capacity-building programs targeting SMEs. Limitations of the study included the cross-sectional design, self-reported instruments, and the relatively poor reliability of the financial health construct. Longitudinal and multi-country designs, more robust financial health indicators, and mediation or moderation models need to be employed in future research to better

describe the processes that tie financial inclusiveness, digital transformation, and innovation performance.

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