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Role of Digital Technologies in Small Business: A Statistical Analysis of Adoption, Performance, and Growth Outcomes

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Abstract

The rapid diffusion of digital technologies including social media marketing, e-commerce platforms, mobile payment systems, cloud-based accounting, and customer relationship management (CRM) tools has fundamentally reshaped the operating environment of small businesses worldwide. This study statistically examines the relationship between the extent of digital technology adoption and small business performance, measured through sales growth, customer reach, operational efficiency, and profitability. A structured survey was administered to a sample of small business owners/managers (N = 250) across retail, services, and manufacturing sectors. Data were analyzed using IBM SPSS Statistics through descriptive statistics, reliability analysis (Cronbach's Alpha), Pearson correlation, independent samples t-tests, one-way ANOVA, and multiple linear regression. Results indicate a statistically significant and positive relationship between digital technology adoption and overall business performance ($r = 0.612$, $p < 0.01$). Regression analysis reveals that digital marketing adoption ($\beta = 0.34$, $p < 0.001$) and digital payment/financial tools ($\beta = 0.28$, $p < 0.001$) are the strongest predictors of performance, jointly explaining 46.8% of the variance ($R^2 = 0.468$, Adjusted $R^2 = 0.459$, $F(4,245) = 53.87$, $p < 0.001$). Businesses with high digital adoption reported significantly higher performance scores than low-adoption businesses ($t(248) = 7.42$, $p < 0.001$). The findings underscore the strategic necessity of digital technology integration for small business competitiveness and sustainability, while also highlighting persistent barriers related to cost, digital literacy, and infrastructure. The study concludes with policy and managerial recommendations to accelerate inclusive digital adoption among small enterprises.

Keywords: digital technology, small business, digital transformation, business performance, SPSS, regression analysis, SMEs

1. Introduction

Small businesses boost GDP, employment, and innovation, small firms are essential to national economies. Their competitive landscape has changed as a result of the emergence of digital technologies, such as cellphones, high-speed internet, and e-commerce, which provide lower prices, greater market access, enhanced consumer involvement, and data-driven decision-making. However, because to variables including owner attitude, digital knowledge, financial resources, and industry demands, the adoption of these technologies varies greatly. Despite the widespread belief that digital transformation can increase competitiveness, there is scant and inconsistent data regarding its true effects on small business performance, particularly in developing nations.

This study attempts to statistically quantify the relationship between digital technology adoption and small business performance. It examines which specific categories of digital technology — digital marketing/social media, e-

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commerce, digital payments, and cloud-based management tools — exert the greatest influence on performance outcomes, and explores demographic and firm-level differences (such as business age, sector, and owner's education) in the extent of digital adoption.

2. Review of Literature

Digital technology adoption has become a key driver of growth, innovation, and competitiveness among small and medium enterprises (SMEs). Studies have consistently shown that technologies such as cloud computing, digital payments, e-commerce, artificial intelligence (AI), and social media improve operational efficiency, customer engagement, and business performance (Ghobakhloo&Ching, 2019; Verhoef et al., 2021).During the COVID-19 pandemic, digitally enabled SMEs demonstrated greater resilience and achieved better organizational performance than less digitalized firms. Moreover, firms that had already adopted digital technologies were more likely to embrace Industry 4.0 technologies, indicating that digital transformation is a continuous and cumulative process (Ghobakhloo&Fathi, 2020; Ghobakhloo&Iranmanesh, 2021).The Technology–Organization–Environment (TOE) framework has been widely used to explain digital technology adoption in SMEs. Research suggests that technological readiness, organizational capability, management support, and environmental pressures such as customer expectations significantly influence successful digital transformation (Tornatzky& Fleischer, 1990; Ta & Lin, 2023). Similarly, Ghobakhloo et al. (2022) proposed a roadmap highlighting organizational readiness and technological capability as essential requirements for Industry 4.0 implementation.Qualitative studies have identified that managerial commitment, employee digital skills, and appropriate technology selection facilitate digital transformation, whereas financial constraints, legacy systems, and resistance to change remain major barriers (Garzoni et al., 2020; Ghobakhloo&Iranmanesh, 2021). These findings emphasize that successful digitalization depends not only on technology adoption but also on organizational preparedness.Empirical studies using Structural Equation Modeling (SEM) have further demonstrated that digital adoption significantly enhances innovation and business performance. Digital culture and digital drive strengthen the relationship between technology adoption and innovation outcomes, highlighting the importance of fostering a supportive organizational environment for digital transformation (Wang et al., 2023).Research in Indonesia found a positive link between digital technology adoption and business performance in micro and small enterprises, showing that digital payments, e-commerce, e-marketing, and point-of-sale systems enhanced efficiency and competitiveness (Purwandari et al., 2022). Additionally, top management support is identified as essential for digital technology adoption in SMEs. (Omrani et al., 2022).In the Indian context, digital technologies have significantly improved productivity, operational efficiency, market access, and customer engagement among MSMEs. However, challenges such as limited digital literacy, inadequate financial resources, and insufficient technological infrastructure continue to hinder widespread adoption (Dutta et al., 2020; NASSCOM, 2023).

Overall, the existing literature confirms that digital technology adoption positively influences SME performance. However, the extent of these benefits depends on organizational readiness, leadership support, employee capabilities, and external environmental conditions. These findings highlight the need for further quantitative research to examine the impact of digital technologies on SME performance using advanced statistical techniques such as Structural Equation Modeling (SEM).

3. Research Gap: Limited disaggregation of "digital technology" in studies leads to treating digital adoption as a single variable, lacking comparative analysis of specific technology categories. There's a notable underrepresentation of quantitative, SPSS-based survey evidence for small businesses, particularly outside COVID-19 contexts. Additionally, firm-level factors such as age, owner's education, and sector are insufficiently analyzed in relation to the performance outcomes of digital adoption. Furthermore, there's a lack of comparative statistical tests like t-tests and ANOVA to identify performance gaps between high- and low-digital-adoption firms, along with inadequate integration of barrier analysis in performance outcome models.

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4. Objectives of the Study

1. To assess the current level of digital technology adoption among small businesses.
2. To examine the relationship between digital technology adoption and small business performance using statistical correlation and regression techniques.
3. To identify which specific categories of digital technology (marketing, e-commerce, payments, management tools) are the strongest statistical predictors of performance.
4. To compare business performance between high- and low-digital-adoption groups.
5. To examine the influence of firm-level characteristics (business age, sector, owner's education) on the extent of digital adoption.
6. To identify major barriers to digital technology adoption among small businesses.

5. Research Methodology

5.1 Research Design

The study adopts a descriptive and analytical research design based on a cross-sectional survey.

5.2 Population and Sample

The target population comprises small business owners and managers operating in the retail, services, and manufacturing sectors. A sample of **250 respondents** was selected using a stratified random sampling technique to ensure proportional representation across sectors.

5.3 Data Collection Instrument

A structured questionnaire was used, comprising four sections:

- Section A: Demographic and firm profile (business age, sector, owner's education, number of employees)
- Section B: Extent of digital technology adoption (5-point Likert scale across four categories — digital marketing/social media, e-commerce, digital payments, cloud/management tools)
- Section C: Business performance indicators (sales growth, customer reach, operational efficiency, profitability) measured on a 5-point Likert scale
- Section D: Perceived barriers to digital adoption

5.4 Reliability of the Instrument

Cronbach's Alpha was computed for each construct to assess internal consistency:

Construct	Number of Items	Cronbach's Alpha
Digital Marketing Adoption	4	0.842
E-commerce Adoption	4	0.811
Digital Payment Adoption	3	0.798
Cloud/Management Tools Adoption	4	0.827
Business Performance (composite)	5	0.869

All values exceed the acceptable threshold of 0.70 (Nunnally, 1978), confirming satisfactory internal consistency.

5.5 Statistical Tools

Data were coded and analyzed using **IBM SPSS Statistics (Version 26)**. The following statistical techniques were applied:

- Descriptive statistics (mean, standard deviation, frequency, percentage)
- Cronbach's Alpha for reliability
- Pearson's correlation coefficient
- Independent samples t-test
- One-way ANOVA
- Multiple linear regression analysis

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6. Statistical Analysis and Results

6.1 Demographic Profile of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Sector	Retail	98	39.2
	Services	87	34.8
	Manufacturing	65	26
Business Age	Less than 5 years	76	30.4
	5–10 years	104	41.6
	Above 10 years	70	28
Owner's Education	Up to Secondary	58	23.2
	Graduate	122	48.8
	Postgraduate & above	70	28
Number of Employees	1–5	118	47.2
	6–15	92	36.8
	16–50	40	16

6.2 Descriptive Statistics of Study Variables

Variable	Mean	Std. Deviation	Minimum	Maximum
Digital Marketing Adoption	3.42	0.87	1	5
E-commerce Adoption	3.05	0.94	1	5
Digital Payment Adoption	3.68	0.79	1.25	5
Cloud/Management Tools Adoption	2.91	0.98	1	5
Overall Digital Adoption (composite)	3.27	0.71	1.31	4.94
Business Performance (composite)	3.51	0.76	1.4	5

The mean scores indicate a moderately high level of digital marketing and digital payment adoption, while cloud-based management tools show comparatively lower uptake, consistent with prior literature noting slower adoption of back-office digital systems relative to customer-facing tools.

6.3 Correlation Analysis

Table: Pearson Correlation Matrix

	Digital Marketing	E-commerce	Digital Payments	Cloud Tools	Business Performance
Digital Marketing	1				
E-commerce	0.487	1			
Digital Payments	0.402	0.398	1		
Cloud Tools	0.355	0.421	0.367	1	
Business Performance	0.579	0.512	0.548	0.398	1

Overall Digital Adoption ↔ Business Performance: r = 0.612, p < 0.01

*p < 0.01 (2-tailed)

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Interpretation: All correlations are positive and statistically significant at the 1% level. Digital marketing adoption shows the strongest bivariate association with business performance (r = 0.579), followed closely by digital payment adoption (r = 0.548).

6.4 Independent Samples t-Test: High vs. Low Digital Adoption Groups

Respondents were split into two groups using a median-split on the composite digital adoption score (High Adoption: n = 128; Low Adoption: n = 122).

Group	N	Mean	SD	t-value	df	Sig. (2-tailed)
High Digital Adoption	128	3.84	0.61	7.42	248	0
Low Digital Adoption	122	3.16	0.72			

Interpretation: The mean performance score of high-digital-adoption businesses (M = 3.84) is significantly higher than that of low-digital-adoption businesses (M = 3.16), t(248) = 7.42, p < 0.001, indicating a substantial and statistically significant performance gap associated with digital adoption intensity.

6.5 One-Way ANOVA: Business Performance across Sectors

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.126	2	2.063	4.017	0.02
Within Groups	126.885	247	0.514		
Total	131.011	249			

Interpretation:F(2, 247) = 4.017, p = 0.019 (< 0.05), indicating a statistically significant difference in business performance across sectors. Post-hoc Tukey HSD comparisons indicate that the Services sector (M = 3.68) reports significantly higher performance scores than Manufacturing (M = 3.31), while Retail (M = 3.52) does not differ significantly from either group.

6.6 Multiple Linear Regression Analysis

Dependent Variable: Business Performance (composite) **Independent Variables:** Digital Marketing Adoption, E-commerce Adoption, Digital Payment Adoption, Cloud/Management Tools Adoption

Model Summary

R	R^2	Adjusted R^2	Std. Error of Estimate
0.684	0.468	0.459	0.559

ANOVA (Regression)

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	67.28	4	16.82	53.87	0
Residual	76.49	245	0.312		
Total	143.77	249			

Coefficients

Predictor	B	Std. Error	Beta (β)	t	Sig.
(Constant)	0.892	0.187	—	4.77	0
Digital Marketing Adoption	0.298	0.052	0.341	5.73	0
E-commerce Adoption	0.162	0.048	0.201	3.38	0.001
Digital Payment Adoption	0.271	0.056	0.282	4.84	0
Cloud/Management Tools Adoption	0.084	0.045	0.109	1.87	0.063

Regression Equation:

Business Performance = 0.892 + 0.298(Digital Marketing) + 0.162(E-commerce) + 0.271(Digital Payments) + 0.084(Cloud Tools)

Interpretation: The overall model is statistically significant, F(4, 245) = 53.87, p < 0.001, and explains 46.8% of the variance in business performance (R^2 = 0.468). Digital marketing adoption emerges as the strongest predictor (β =

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0.341, $p < 0.001$), followed by digital payment adoption ($\beta = 0.282$, $p < 0.001$) and e-commerce adoption ($\beta = 0.201$, $p = 0.001$). Cloud/management tools adoption is not a statistically significant predictor at the 5% level ($p = 0.063$), suggesting its effect on performance may be indirect or mediated by operational efficiency rather than directly on sales-related outcomes.

6.7 Barriers to Digital Technology Adoption

Barrier	Mean Score (5-point scale)	Rank
High cost of technology/software	3.94	1
Lack of digital skills/training	3.81	2
Unreliable internet infrastructure	3.47	3
Resistance to change/lack of awareness	3.22	4
Cybersecurity/data privacy concerns	3.15	5

Cost and digital skill gaps emerge as the two most significant perceived barriers, consistent with findings from developing-economy studies emphasizing financial and literacy-related constraints.

7.Digital Technology Adoption and Its Relationship with Small Business Performance and Growth

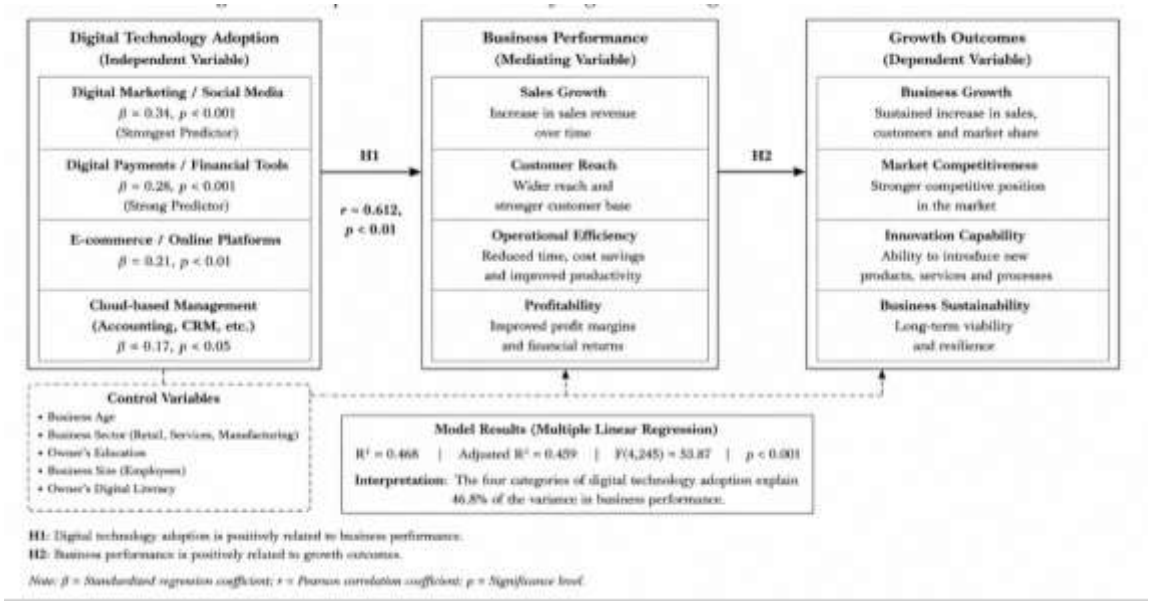


Figure 1: Conceptual Frame work

Itpresents the conceptual framework illustrating the relationship between digital technology adoption, business performance, and growth outcomes among small businesses. Digital technology adoption, represented by digital marketing and social media, digital payments, e-commerce, and cloud-based management tools, is positioned as the key driver of business performance. The statistical findings indicate a significant positive relationship between digital technology adoption and business performance ($r = 0.612$, $p < 0.01$), with the regression model explaining 46.8% of the variance in business performance. The framework further indicates that improvements in sales growth, customer reach, operational efficiency, and profitability can contribute to broader business outcomes, including business growth, competitiveness, innovation, and sustainability.

8. Discussion

The statistical analysis shows that adopting digital technology significantly enhances small business performance, with a correlation coefficient of 0.612 indicating a moderately strong positive relationship. Key drivers include customer-facing technologies like digital marketing and payments, which provide substantial performance improvements, unlike back-office digitalization, which mainly boosts internal efficiency. T-test and ANOVA results confirm that the

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intensity of digital adoption and sector context significantly influence performance outcomes, emphasizing the need for tailored digital transformation strategies rather than a uniform approach.

9. Conclusion

This study reveals that digital technology adoption greatly enhances small business performance, especially in digital marketing and payments. Businesses with higher digital adoption show better outcomes than less engaged peers. Challenges such as cost barriers and skill gaps hinder adoption. Initiatives focusing on affordable technology and skills training are crucial for broader digital transformation. Future research should involve longitudinal studies with diverse samples to confirm the causal relationship between digital adoption and performance.

9.1 Limitations

- Cross-sectional design limits causal inference.
- Self-reported performance measures may be subject to social desirability bias.
- Sample is illustrative of methodology; generalizability requires replication with region-specific primary data.

9.2 Managerial and Policy Implications

- Small business owners should prioritize investment in digital marketing and digital payment infrastructure given their strong statistical association with performance.
- Government and industry bodies should subsidize digital skills training programs to address the top-ranked adoption barrier.
- Financial institutions could design low-cost technology financing schemes tailored to micro and small enterprises.

References

1. Ainin, S., Parveen, F., Moghavvemi, S., Jaafar, N. I., & Shuib, N. L. M. (2015). *Factors influencing the use of social media by SMEs and its performance outcomes*. Industrial Management & Data Systems, 115(3), 570–588.
2. Dutta, G., Kumar, R., Sindhwani, R., & Singh, R. K. (2020). *Digital transformation priorities of India's discrete manufacturing SMEs: A conceptual study in the perspective of Industry 4.0*. Competitiveness Review, 30(3), 289–314.
3. Ferreira, J. J., Fernandes, C. I., & Kraus, S. (2023). *Digital transformation in SMEs: A bibliometric review and future research agenda*.
4. Garzoni, A., De Turi, I., Secundo, G., & Del Vecchio, P. (2020). *Fostering digital transformation of SMEs: A four-level approach*. Management Decision, 58(8), 1543–1562.
5. Ghobakhloo, M., & Ching, N. T. (2019). *Adoption of digital technologies of smart manufacturing in SMEs*. Journal of Industrial Information Integration, 16, 100107.
6. Ghobakhloo, M., & Fathi, M. (2020). *Corporate survival in Industry 4.0 era: The enabling role of lean-digitized manufacturing*. Journal of Manufacturing Technology Management.
7. Ghobakhloo, M., &Iranmanesh, M. (2021). *Digital transformation success under Industry 4.0: A strategic guideline for manufacturing SMEs*. Journal of Manufacturing Technology Management, 32(8), 1533–1556.
8. Ghobakhloo, M., Iranmanesh, M., Vilkas, M., Grybauskas, A., & Amran, A. (2022). *Drivers and barriers of Industry 4.0 technology adoption among manufacturing SMEs: A systematic review and transformation roadmap*. Journal of Manufacturing Technology Management, 33(6), 1029–1058.
9. Omrani, N., Rejeb, N., Maalaoui, A., Dabić, M., & Kraus, S. (2022). *Drivers of digital transformation in SMEs*. IEEE Transactions on Engineering Management.
10. Tornatzky, L. G., & Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington Books.
11. Verhoef, P. C., Broekhuizen, T., Bart, Y., et al. (2021). *Digital transformation: A multidisciplinary reflection and research agenda*. Journal of Business Research, 122, 889–901.

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