

Digital Transformation and Firm Performance: Empirical Evidence from MENA Listed Companies

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Abstract: This study empirically examines the relationship between digital transformation (DT) intensity and firm performance among companies listed on stock exchanges across the Middle East and North Africa (MENA) region. Digital transformation—defined as the strategic integration of digital technologies into core business operations, customer engagement, and organizational processes—has been widely hypothesized to improve firm performance, yet large-scale empirical evidence from MENA emerging markets remains limited. Drawing on a primary survey dataset of 186 senior managers and C-suite executives across 94 MENA-listed firms collected between October 2023 and March 2024, this study operationalizes DT intensity across four dimensions: cloud infrastructure adoption, data analytics capability, digital customer interface maturity, and internal process automation depth. Firm performance is measured using three indicators: return on assets (ROA), revenue growth rate, and a composite operational efficiency index. Ordinary least squares (OLS) regression with robust standard errors and moderation analysis reveal that DT intensity is positively and significantly associated with all three performance indicators, with the strongest effect on operational efficiency ($\beta = 0.412$, $p < 0.001$). Innovation culture and leadership digital literacy significantly moderate the DT-performance relationship, with both variables amplifying performance returns to DT investment. Firm size negatively moderates the DT-ROA relationship, consistent with the hypothesis that digital agility advantages are larger in smaller MENA firms. These findings contribute to the emerging literature on digital transformation in developing economy contexts and offer actionable guidance for MENA executives navigating technology-driven competitive disruption.

Keywords: Digital Transformation, Firm Performance, MENA, Emerging Markets, Digital Innovation, Technology Adoption

Type: Research Paper



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1. Introduction

Digital transformation has emerged as the defining strategic challenge of the contemporary business environment. The convergence of cloud computing, big data analytics, artificial intelligence, the Internet of Things, and mobile connectivity has created both an imperative and an opportunity for firms to fundamentally reconfigure their operations, customer relationships, and competitive strategies around digital capabilities (Bharadwaj et al., 2013; Vial,

2019). The COVID-19 pandemic dramatically accelerated these trends, compressing what might have been decade-long digital adoption curves into months and revealing the performance consequences of digital readiness—and digital unreadiness—with unusual clarity (McKinsey, 2020).

In MENA economies, digital transformation is proceeding against a distinctive backdrop: rapid smartphone penetration, young and digitally native populations, government-led digitization initiatives (Saudi Vision 2030, UAE Digital Economy Strategy, Egypt's Digital Egypt program), and private sector dynamics shaped by family business dominance, regulatory heterogeneity, and infrastructure gaps that vary substantially across the region (World Bank, 2021). Understanding how digital transformation affects firm performance in this context—where the institutional enablers and constraints of DT differ substantially from those in advanced economies where most existing research was conducted—is both theoretically important and practically urgent.

This study addresses three research questions: (1) Is DT intensity positively associated with firm performance among MENA-listed companies? (2) Do innovation culture and leadership digital literacy moderate the DT-performance relationship? (3) Does firm size moderate the effect of DT on financial performance? The study contributes to the literature by providing large-sample empirical evidence on the DT-performance relationship in a MENA emerging market context and by examining moderating mechanisms that shape when DT investments translate into performance gains.

2. Literature Review and Hypotheses

2.1. Digital Transformation and Firm Performance

The theoretical case for a positive DT-performance relationship rests on resource-based view arguments (Barney, 1991): digital capabilities constitute valuable strategic resources (they enable cost reduction, revenue growth, and innovation), rare (not uniformly distributed across firms), inimitable (bundled with organizational routines and human capital that competitors cannot easily replicate), and non-substitutable (in many competitive contexts, the absence of digital capabilities constitutes a significant competitive disadvantage). Empirical evidence from advanced economies broadly supports a positive DT-performance association, though the effect size varies with industry context, implementation quality, and the performance metric employed (Brynjolfsson & McAfee, 2017; Hess et al., 2016). Evidence from emerging markets is sparser but generally consistent (Nasiri et al., 2020). We hypothesize:

H1: Digital transformation intensity is positively associated with (H1a) ROA, (H1b) revenue growth, and (H1c) operational efficiency.

2.2. Moderating Role of Innovation Culture

Innovation culture—the organizational norms, values, and practices that encourage experimentation, learning from failure, and creative problem-solving—has been theorized as a key enabler of DT value creation (Westerman et al., 2014). Digital technologies create opportunities for value creation but do not realize that value automatically; firms with strong innovation cultures are better positioned

to exploit digital capabilities through iterative experimentation, cross-functional collaboration, and rapid response to market feedback. We hypothesize:

H2: Innovation culture positively moderates the relationship between DT intensity and firm performance.

2.3. Moderating Role of Leadership Digital Literacy

Leadership digital literacy—the capacity of C-suite and senior executives to understand, evaluate, and strategically direct digital technologies—has been identified as a critical enabler of effective DT (Bharadwaj et al., 2013; Kane et al., 2019). Leaders with high digital literacy are better positioned to set coherent DT visions, allocate resources to high-potential digital initiatives, and build the organizational capabilities needed to translate digital investment into performance. We hypothesize:

H3: Leadership digital literacy positively moderates the relationship between DT intensity and firm performance.

2.4. Moderating Role of Firm Size

Theory and evidence on the relationship between firm size and DT effectiveness are mixed. Larger firms have greater resources for DT investment but face organizational inertia, legacy system complexity, and coordination costs that can impede digital agility (Matt et al., 2015). Smaller firms face resource constraints but may achieve faster, more coherent DT implementation due to simpler organizational structures and shorter decision chains. We hypothesize:

H4: Firm size negatively moderates the relationship between DT intensity and ROA.

3. Materials and Methods

3.1. Sample and Data Collection

Primary data were collected via a structured online questionnaire distributed to senior managers and C-suite executives at firms listed on seven MENA stock exchanges: Tadawul (Saudi Arabia), Dubai Financial Market, Abu Dhabi Securities Exchange, Boursa Kuwait, Bahrain Bourse, Amman Stock Exchange, and the Egyptian Exchange. The survey was conducted between October 2023 and March 2024. Purposive sampling targeted firms with at least 100 employees and a minimum of five years of listing history. A total of 186 usable responses were obtained from 94 firms, representing a firm-level response rate of 62.7% of the 150 targeted firms. Participating firms span nine sectors: banking and financial services (28%), technology and telecommunications (19%), retail and consumer goods (17%), industrial manufacturing (14%), real estate (11%), healthcare (7%), and other (4%).

3.2. Measures

Digital transformation intensity was measured using a 16-item composite scale spanning four dimensions: cloud infrastructure adoption (4 items), data analytics capability (4 items), digital customer interface maturity (4 items), and

internal process automation depth (4 items). All items were rated on a five-point Likert scale (1 = not adopted, 5 = fully integrated). The composite DT intensity score is the mean of all 16 items (Cronbach's $\alpha = 0.891$). Firm performance was operationalized as: (1) return on assets (ROA), derived from audited financial statements for the most recent fiscal year; (2) revenue growth rate (%), the year-on-year percentage change in total revenue; and (3) operational efficiency index, a composite of cost-to-income ratio (inverted), asset turnover, and manager-rated operational performance ($\alpha = 0.847$). Innovation culture was measured using an eight-item scale adapted from Tellis et al. (2009) ($\alpha = 0.823$). Leadership digital literacy was measured using a six-item scale adapted from Kane et al. (2019) ($\alpha = 0.839$). Firm size was measured as the natural logarithm of total assets. Control variables included firm age, leverage, and sector dummies.

3.3. Analytical Strategy

Hypotheses were tested using OLS regression with heteroscedasticity-robust standard errors. Moderation hypotheses were tested by including interaction terms between DT intensity and each moderator, following the procedures recommended by Hayes (2018). Multicollinearity was assessed using variance inflation factors (VIF); all VIF values fell below 3.5, indicating acceptable collinearity levels. Common method bias was assessed using Harman's single-factor test; the largest factor explained 24.3% of variance, below the 50% threshold indicating problematic common method bias.

4. Results

4.1. Descriptive Statistics

Table 1 shows that DT intensity scores are moderate on average ($M = 3.28$, $SD = 0.74$), indicating that MENA-listed firms have adopted digital technologies to a meaningful but not yet advanced degree. Substantial variance in DT intensity (range: 1.63–4.91) provides adequate statistical power for regression analysis. All performance indicators show significant bivariate correlations with DT intensity ($r = .41$, $.36$, and $.48$ for ROA, revenue growth, and operational efficiency, respectively), consistent with H1.

Table 1: Descriptive Statistics and Correlations

Variable	M	SD	1	2	3	4	5	6
1. DT Intensity	3.28	0.74	—					
2. ROA (%)	6.14	3.82	.41**	—				
3. Revenue Growth (%)	8.37	6.11	.36**	.44**	—			
4. Op. Efficiency	3.54	0.68	.48**	.52**	.39**	—		
5. Innovation Culture	3.41	0.71	.39**	.31**	.27**	.44**	—	
6. Leadership DL	3.19	0.83	.33**	.28**	.31**	.37**	.41**	—

Note. M = mean; SD = standard deviation; DL = digital literacy. * $p < .05$; ** $p < .01$. $n = 186$.

4.2. Regression Results: Main Effects (H1)

Table 2 shows that DT intensity is positively and significantly associated with all three performance indicators: ROA ($\beta = 0.318$, $p < 0.01$), revenue growth ($\beta = 0.291$, $p < 0.01$), and operational efficiency ($\beta = 0.412$, $p < 0.001$), fully supporting H1. The effect is strongest for operational efficiency, consistent with prior evidence that digital process automation generates more immediate and measurable efficiency returns than revenue or profitability gains, which take longer to materialize.

Table 2: OLS Regression Results: DT Intensity and Firm Performance

Predictor	ROA (β)	Rev. Growth (β)	Op. Efficiency (β)	R ²
DT Intensity	.318** (.063)	.291** (.071)	.412*** (.058)	
Firm Size (control)	.124* (.054)	.089 (.067)	.096 (.052)	
Firm Age (control)	.081 (.048)	.062 (.059)	.071 (.047)	
Leverage (control)	-.147** (.049)	-.118* (.061)	-.103* (.048)	
Model R ²	.38	.31	.44	
Adjusted R ²	.35	.28	.42	
F-statistic	14.21***	10.47***	18.63***	

Note. Robust standard errors in parentheses. Sector dummies included but not reported. * $p < .05$; ** $p < .01$; *** $p < .001$. $n = 186$.

4.3. Moderation Results (H2, H3, H4)

Based on Table 3, innovation culture significantly amplifies the DT-performance relationship across all three outcomes (H2 supported). Leadership digital literacy similarly strengthens DT's performance effects (H3 supported). Firm size negatively moderates the DT-ROA relationship ($\beta = -0.162$, $p < 0.05$), supporting H4: smaller MENA firms realize greater financial returns per unit of DT investment, consistent with the digital agility hypothesis.

Table 3: Moderation Analysis Results

Interaction Term	ROA (β)	Revenue Growth (β)	Op. Efficiency (β)
DT $\times$ Innovation Culture	.214** (.071)	.198** (.078)	.231*** (.065)
DT $\times$ Leadership DL	.187* (.082)	.221** (.079)	.204** (.074)
DT $\times$ Firm Size (Log TA)	-.162* (.077)	-.091 (.088)	-.078 (.073)
ΔR^2 from interactions	.07**	.06**	.08***

Note. DL = digital literacy; TA = total assets. Controls and main effects included but not reported. * $p < .05$; ** $p < .01$; *** $p < .001$.

5. Conclusion

This study provides empirical evidence that digital transformation intensity is positively associated with firm performance among MENA-listed companies, with operational efficiency as the strongest and most immediate performance return. Innovation culture and leadership digital literacy amplify these returns, while firm size attenuates the DT-ROA relationship, suggesting that digital agility advantages favor smaller firms in the MENA context. These findings carry clear practical implications: MENA executives should treat DT investment as complementary to, rather than substitutable for, investments in organizational culture and leadership capability development. Regulatory bodies and development finance institutions supporting MENA private sector digital

transformation should consider conditioning digital investment support on demonstrated organizational readiness, assessed through culture and leadership dimensions, not merely technological adoption metrics. Future research should employ longitudinal designs to establish causal direction and examine whether the DT-performance relationship strengthens as MENA digital ecosystems mature.

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