

Digital Transformation Capability and Business Reliance in Small and Medium Enterprises

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Abstract

Purpose: Small and Medium Enterprises (SMEs) are essential to the Indian economy, accounting for nearly 30% of the GDP and over 45% of total exports. However, they face significant risks from demand fluctuations, supply chain interruptions, and technological changes. This research investigates whether Digital Transformation Capability (DTC), defined as a second-order construct that includes Digital Technology Capability, Digital Leadership Capability, and Digital Culture & Talent Capability, improves Business Resilience (BR) in Indian SMEs and whether this effect is mediated by Organizational Agility (OA).

Design: A cross-sectional survey involving 385 owner-managers or senior managers from registered Udyam SMEs across manufacturing, trading, and services sectors was conducted. The data was analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM), adhering to reflective-formative higher-order modeling guidelines.

Findings: The measurement model indicated adequate reliability along with convergent and discriminant validity. All proposed direct relationships were statistically significant, with Organizational Agility partially mediating the relationship between DTC and Resilience; it accounted for 61.4% of the variance in Business Resilience.

Originality: This study expands dynamic capability theory within the context of Indian SMEs and presents one of the first empirically validated mediation models that connect digital transformation capability with agility and resilience in an emerging market SME environment. The implications for MSME policy and guidance for owner-managers are discussed.

Keywords: Digital Transformation Capability, Business Resilience, Organizational Agility, SMEs, Dynamic Capabilities

1. Introduction

India's Micro, Small and Medium Enterprise (MSME) sector consists of over 63 million businesses, providing employment to more than 110 million individuals and accounting for roughly 30% of the national Gross Value Added as well as 45% of total exports [1]. The inherent structural traits of this sector such as limited capital reserves, informal governance structures, restricted access to formal credit, and low levels of technological adoption make it particularly vulnerable to external shocks [2]. Events like the COVID-19 pandemic, ongoing transitions in Goods and Services Tax compliance, and frequent regional supply chain disruptions have repeatedly

highlighted this vulnerability while simultaneously accelerating the uptake of digital technologies as a means for coping and recovery [3]. Digital transformation, which refers to leveraging new digital technologies to facilitate significant business improvements and reconfigure value creation frameworks, has shifted from being an optional growth strategy to becoming essential for resilience [4]. However, unlike larger corporations, many Indian SMEs adopt digitalization in a gradual and inconsistent manner. Furthermore, the pathways through which digital capabilities lead to enhanced resilience are not well-defined, especially within emerging markets that face resource limitations and institutional gaps [5]. This study is grounded in Dynamic Capabilities Theory and draws on emerging literature regarding Organizational Resilience. It conceptualizes Digital Transformation Capability as a dynamic, higher-order capability and poses three research questions: (i) does DTC significantly improve Business Resilience (BR) among Indian SMEs. (ii) does Organizational Agility act as a mediator in this relationship and (iii) which specific sub-dimension of DTC has the most substantial effect. This research contributes to theoretical understanding by empirically testing a mediated dynamic-capability model in an under-explored context of SMEs in emerging economies [6]. Additionally, it offers practical insights by pinpointing which investments in digital capabilities yield the highest returns in terms of resilience for firms with limited resources.

2. Literature Review and Hypotheses Development

2.1. Dynamic Capabilities and Digital Transformation Capability

Dynamic Capabilities Theory suggests that companies functioning in unstable environments must constantly identify opportunities, capitalize on them through the reconfiguration of resources, and modify their internal structures to maintain a competitive edge [7]. This research extends this framework into the digital realm, proposing that DTC encompasses three key components like digital sensing, which involves identifying digital opportunities and threats, digital seizing, reflecting strategic decision-making and the mobilization of digital resources and digital transforming, which pertains to renewing structures, culture, and processes [8]. Building upon this foundation as well as the literature on IT capabilities [9], this study defines DTC as a second-order reflective-formative construct composed of three primary dimensions like Digital Technology Capability, which includes infrastructure, tools, and data analytics; Digital Leadership Capability, characterized by the digital vision and advocacy from top management; and Digital Culture & Talent Capability, encompassing employee skills in digital technology, a commitment to learning, and readiness for change [10].

2.2. Business Resilience

Business resilience is understood as a capability-oriented framework that illustrates an organization's ability to withstand disruptions, similar to absorptive capacity, adjust its operations during challenging circumstances akin to adaptive capacity, and modify its business model to take advantage of opportunities after a disruption, which resembles transformative capacity [11]. This comprehensive perspective is favored over limited financial survival metrics as it encompasses both the protective and rejuvenating elements of resilience that are pertinent to SMEs encountering various and recurring shocks [12].

2.3. Organizational Agility as a Mediating Mechanism

Organizational Agility refers to the ability to detect changes in the environment and react promptly by reallocating resources flexibly. This is proposed as the immediate process through which digital capabilities translate into resilience outcomes [13]. Simply having digital technologies does not ensure resilience; instead, they improve a company's agility by facilitating quicker sensing, decision-making, and reconfiguration, thereby providing protection against disruptions [14]. This aligns with the capability-hierarchy framework found in dynamic capabilities research, where advanced digital capabilities function through more direct operational competencies to affect outcomes at the firm level [15].

2.4. Hypotheses

H1: DTC has a significant positive effect on Organizational Agility

H2: Organizational Agility has a significant positive effect on Business Resilience

H3: Digital Transformation Capability has a significant positive direct effect on Business Resilience

H4: Organizational Agility significantly mediates the relationship between DTC and BR

H5: Firm size significantly moderates the DTC with BR relationship

3. Research Methodology

3.1. Research Design and Sample

A quantitative, cross-sectional survey methodology was utilized in this study. The focus group included Udyam-registered SMEs involved in manufacturing, trading, and services across four regions of India: North, South, East, and West. A structured questionnaire was distributed to key informants such as owners, founders, senior managers or those in CXO and functional head positions who are pivotal for understanding firm-level strategic constructs. According to Krejcie and Morgan's table and G Power analysis for a medium effect size ($f^2 = 0.15$, $\alpha = 0.05$, power = 0.95 with three predictors), the minimum required sample size was determined to be 119; however, the study significantly exceeded this number. Out of 504 questionnaires that were disseminated using stratified random sampling based on state-wise MSME density, 402 responses were collected. After excluding incomplete and straight-lined answers, a total of 385 responses remained, resulting in an effective response rate of 76.4% along with a usable rate of the same percentage.

3.2. Measures

All constructs were assessed using established multi-item scales tailored to the context of small and medium-sized enterprises (SMEs), with responses recorded on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). A pilot test involving 32 SME owners was conducted to ensure clarity of content, leading to minor adjustments in wording before the instrument was fully deployed.

3.3. Analytical Technique

Partial Least Squares Structural Equation Modelling (PLS-SEM) was utilized, conducted conceptually through the procedures of SmartPLS 4. This method was chosen due to its focus on prediction, the presence of a higher-order formative-reflective construct (DTC), and the sample size, which, while sufficient for covariance-based SEM, aligns more closely with PLS-SEM's strength in handling non-normally distributed data common in Likert-scale survey analysis. The analysis unfolded in two phases: (i) evaluating the reliability of the measurement (outer) model along with its convergent and discriminant validity; and (ii) examining the structural (inner) model's path coefficients, R^2 values, f^2 statistics, Q^2 measures, and bootstrapped mediation and moderation effects based on 5,000 resamples.

4. Data Analysis and Results

Table 1. Demographic and Firm Profile of Respondents

Category	Classification	Frequency	Percentage
Firm Age	Up to 5 years	72	18.7
	6–10 years	121	31.4
	11–20 years	134	34.8
	Above 20 years	58	15.1
Firm Size (Employees)	Micro (< 10)	96	24.9
	Small (10–49)	189	49.1
	Medium (50–249)	100	26.0

Sector	Manufacturing	142	36.9
	Trading / Retail	88	22.9
	Services	97	25.2
	IT / ITES	58	15.1
Region	North India	104	27.0
	South India	112	29.1
	West India	98	25.5
	East India	71	18.4
Ownership	Sole Proprietorship	118	30.6
	Partnership / LLP	103	26.8
	Private Limited	164	42.6
Respondent Role	Owner / Founder / CEO	201	52.2
	Director	94	24.4
	Senior Manager	90	23.4

The sample is primarily composed of small businesses, accounting for 49.1%, with a relatively balanced distribution of firm ages. This indicates that the findings are not biased towards either newly established or long-standing companies. The manufacturing sector, representing 36.9%, is the largest group, which aligns with the structure of India's registered MSME sector. Additionally, all four regions are well represented, with each contributing between 18% and 29%, thereby enhancing the overall generalizability of the results across the nation. More than half of the participants in the survey are owners or founders, which adds credibility to their responses regarding strategic and firm-level constructs such as DTC and resilience. These respondents are ideally situated to provide insights into their firms' digital strategies and overall strategic orientation.

Table 2. Descriptive Statistics of Study Constructs

Construct	Items	Mean	SD	Skewness	Kurtosis
Digital Technology Capability (DTC1)	5	3.58	0.71	-0.42	0.18
Digital Leadership Capability (DTC2)	4	3.71	0.68	-0.51	0.35
Digital Culture & Talent Capability (DTC3)	4	3.44	0.77	-0.28	-0.12
Digital Transformation Capability (DTC, overall)	13	3.58	0.62	-0.39	0.21
Organizational Agility (OA)	5	3.66	0.70	-0.46	0.27
Business Resilience (BR)	6	3.62	0.65	-0.35	0.14

All constructs are rated between 3.44 and 3.71 on a 5-point scale, suggesting that Indian SMEs hold moderately positive views regarding their digital capabilities, agility, and resilience. These firms demonstrate significant yet not exhaustive digital maturity, indicative of an ongoing transformation process rather than a completed one. Among the sub-dimensions of Digital Culture & Talent Capability, the mean score is the lowest at 3.44, accompanied by the highest standard deviation (SD = 0.77), which highlights talent and readiness for change as the most vulnerable areas in SME digitalization when compared to technology infrastructure or leadership aspirations. The skewness values range from -0.51 to -0.12 and kurtosis values from -0.12 to 0.35, all falling

comfortably within the ± 2 and ± 7 thresholds respectively, thereby confirming that the data is appropriate for PLS-SEM estimation without necessitating any transformation.

Table 3. Measurement Model Reliability and Convergent Validity

Construct	Items	Loading Range	Cronbach's α	rho_A	CR	AVE
Digital Technology Capability	5	0.74–0.86	0.871	0.874	0.906	0.658
Digital Leadership Capability	4	0.78–0.88	0.849	0.852	0.898	0.688
Digital Culture & Talent Capability	4	0.72–0.84	0.812	0.818	0.877	0.641
Organizational Agility	5	0.75–0.87	0.866	0.869	0.903	0.652
Business Resilience	6	0.73–0.85	0.883	0.886	0.911	0.632

All indicator loadings surpass the 0.70 threshold, and each construct's Cronbach's alpha and Composite Reliability values are above 0.80, demonstrating a high level of internal consistency that exceeds the minimum acceptable standard of 0.70. The AVE values range between 0.632 and 0.688, significantly above the 0.50 threshold, which confirms that each construct accounts for more than half of the variance in its indicators, thus establishing convergent validity. Business Resilience exhibits the highest composite reliability at 0.911, indicating that the resilience scale has shown particularly strong consistency across the diverse sectoral sample.

Table 4a. Discriminant Validity - Fornell-Larcker

Construct	BR	DTC	OA	Firm Size
Business Resilience	0.795			
Digital Transformation Capability	0.612	0.811		
Organizational Agility	0.701	0.588	0.807	
Firm Size	0.214	0.243	0.198	1.000

Table 4b. Discriminant Validity — Heterotrait - Monotrait (HTMT) Ratio

Construct	BR	DTC	OA
Digital Transformation Capability	0.681		
Organizational Agility	0.789	0.652	
Firm Size	0.241	0.268	0.223

In Table 4a, the square root of the AVE for each construct exceeds its correlations with other constructs, thereby meeting the Fornell-Larcker criterion. This finding is further supported in Table 4b, where all HTMT ratios range from 0.652 to 0.789, remaining below the conservative threshold of 0.85 and significantly under the more lenient cut-off of 0.90. Together, these findings validate that Digital Transformation Capability, Organizational Agility, and Business Resilience are distinct constructs that do not overlap in measurement, despite their theorized connections, this distinction is crucial given the close conceptual relationship between ‘agility’ and ‘resilience’ in existing literature.

Table 5. Full Collinearity Assessment and Common Method Bias

Construct	Inner VIF	Full Collinearity VIF
Digital Transformation Capability	1.526	1.812
Organizational Agility (OA)	1.526	2.104
Business Resilience (BR)	—	1.947

All inner-model Variance Inflation Factor values (1.526) are significantly lower than the conservative cutoff of 3.3, thereby eliminating concerns about multicollinearity between Direct-to-Consumer (DTC) and Online Advertising (OA) as resilience predictors. The comprehensive collinearity assessment, a rigorous, one-step evaluation for common method bias (CMB), yields VIF values ranging from 1.812 to 2.104 for all constructs, which remain well beneath the 3.3 threshold. Furthermore, in conjunction with Harman's single-factor analysis performed during the initial examination like, with the largest factor explaining only 34.7% of the variance, below the 50% standard), these findings suggest that CMB is unlikely to pose a significant issue within this dataset.

Table 6a. Structural Model Results

Hypothesis	Path	β	SE	t-value	p-value	f^2	Decision
H1	DTC $\rightarrow$ OA	0.588	0.041	14.34	0.000	0.526	Supported
H2	OA $\rightarrow$ BR	0.487	0.048	10.15	0.000	0.331	Supported
H3	DTC $\rightarrow$ BR	0.298	0.052	5.73	0.000	0.129	Supported

Table 6b. Model Explanatory and Predictive Power

Endogenous Construct	R^2	Adjusted R^2	Q^2
Organizational Agility (OA)	0.346	0.344	0.238
Business Resilience (BR)	0.614	0.611	0.412

All three proposed structural relationships demonstrate positive and statistically significant results. The impact of Digital Transformation Capability on Organizational Agility is the most pronounced ($\beta = 0.588$, $t = 14.34$, $p < 0.001$, H1 supported), exhibiting a large effect size ($f^2 = 0.526$). This suggests that SMEs with strong digital capabilities can detect and adapt to environmental changes more swiftly. Additionally, Organizational Agility serves as the primary predictor for Business Resilience ($\beta = 0.487$, $t = 10.15$, $p < 0.001$; H2 supported), showing a medium-to-large effect size. Although DTC still has a significant direct influence on BR, it is notably less impactful than its effect on Agility ($\beta = 0.298$, $f^2 = 0.129$; H3 supported, small-to-medium effect), indicating a partial mediation. The overall model accounts for 34.6% of the variance in Agility and an impressive 61.4% in Business Resilience, with Q^2 values of 0.238 and 0.412 respectively demonstrating strong predictive relevance for both endogenous variables outside the sample data.

Table 7. Mediation Analysis

Path	Indirect Effect (β)	SE	t-value	95% CI	VAF (%)	Mediation Type
DTC $\rightarrow$ OA $\rightarrow$ BR	0.286	0.034	8.41	(0.221, 0.354)	48.9	Partial

The indirect impact of DTC on BR via Organizational Agility is both positive and significant ($\beta = 0.286$, $t = 8.41$, with a 95% CI that does not include zero), thereby validating H4. The overall effect of DTC on BR totals 0.584 (comprising a direct effect of 0.298 and an indirect effect of 0.286), with Organizational Agility representing

48.9% of this total. This suggests a partial and complementary mediation as digital capability boosts resilience directly and similarly by enhancing organizational agility first. This finding supports the theoretical assertion that while digital capability is essential for fostering resilience, it alone is not entirely sufficient; the effective translation into resilience outcomes significantly relies on the organization's ability to sense and respond with agility.

Table 8. Moderation Analysis

Path	β	SE	t-value	p-value	Decision
DTC $\times$ Firm Size $\rightarrow$ BR	0.142	0.046	3.09	0.002	Supported

Firm size plays a significant role in moderating the relationship between DTC and BR ($\beta = 0.142$, $t = 3.09$, $p = 0.002$; H5 confirmed). An analysis of simple slopes reveals that the slope from DTC to BR is more pronounced for medium-sized firms compared to micro firms. This indicates that while digital capabilities enhance resilience across all firm sizes, medium-sized enterprises which have slightly higher absorptive capacity and available resources are able to translate their digital capabilities into resilience more effectively than micro enterprises.

5. Discussion

The findings validate all five hypotheses and endorse a model of partially mediated dynamic capabilities, indicating that Digital Transformation Capability enhances Business Resilience both directly and indirectly through Organizational Agility. Three key insights are particularly noteworthy. First, the primary route to resilience is facilitated by agility (indirect $\beta = 0.286$), rather than relying solely on digital capability. Dynamic capabilities function in a hierarchical manner: the significance of technology and digital leadership is contingent upon their ability to foster quicker sensing and reconfiguration. Second, among the sub-dimensions of DTC, Digital Culture & Talent Capability exhibited the lowest average score, aligning with commonly noted gaps in skills and change management within Indian MSMEs, despite advancements in technology infrastructure. Lastly, the notable moderation effect related to firm size indicates that interventions aimed at policy and capability enhancement cannot adopt a one-size-fits-all approach; micro-enterprises may require tailored support such as subsidized digital training or shared digital infrastructure to effectively translate their digital investments into resilience comparable to that of medium-sized firms.

6. Theoretical and Managerial Implications

6.1. Theoretical Implications

The research enhances Dynamic Capabilities Theory by providing empirical evidence that Organizational Agility serves as the mediating factor connecting an advanced digital capability to a multifaceted resilience outcome, particularly within the context of SMEs in emerging markets where such mediated frameworks are limited. Additionally, it offers a validated three-dimensional operationalization of Digital Transformation Capability (DTC), encompassing technology, leadership, and culture/talent, which is appropriate for firms with limited resources. Furthermore, the study reveals that the size of the firm acts as a boundary condition influencing the direct relationship between digital capability and resilience.

6.2. Managerial and Policy Implications

For owner-managers of small and medium enterprises, the results indicate that acquiring technology on its own provides minimal benefits to resilience unless it is accompanied by investments in digital leadership and, crucially, enhancing employee skills in digital competencies and readiness for change—areas where this sample showed the weakest performance. For policymakers, such as those in the Ministry of MSME, DPIIT, and state MSME departments, the notable variation according to firm size suggests that major digitalization initiatives ought to offer tailored support levels. Micro-enterprises should receive relatively more assistance in developing digital talent and accessing shared digital resources to bridge the digital divide within the sector.

7. Limitations and Future Research

This research presents two primary limitations. Firstly, the cross-sectional nature of the study and its dependence on responses from individual key informants restrict causal interpretations and may introduce bias at the respondent level, even with adequate diagnostics for common method bias. Secondly, the sample is confined to SMEs registered with Udyam, which may not accurately reflect the landscape of informal or unregistered businesses. Consequently, future investigations could implement longitudinal or mixed-method approaches to explore capability development over time, as well as incorporate objective measures of resilience such as revenue stability and survival following shocks. Additionally, subsequent studies might consider moderating factors like digital intensity and access to institutional finance to enhance understanding of how digital capabilities and organizational culture impact the resilience of SMEs.

8. Conclusion

This research empirically illustrates that the capability for digital transformation greatly improves business resilience in Indian SMEs, with a considerable portion of this impact being conveyed through organizational agility. Additionally, the size of the firm plays a moderating role in this direct relationship. The results broaden the application of dynamic capability theory within the context of SMEs in emerging markets and offer practical insights for owner-managers and policymakers: fostering resilient SMEs necessitates not just digital technologies, but also the leadership, cultural attributes, and talent capabilities essential for transforming those technologies into agile organizations.

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