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Technological, Organisational, and Environmental Antecedents of Digital Orientation: Evidence from Textile MSMEs in India

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ABSTRACT

Digital orientation- the strategic disposition of a firm to embed digital technologies as a central element of its competitive logic and value creation processes- has emerged in recent years as a critical organisational construct in the digital transformation literature. Despite growing scholarly consensus on its importance, the contextual antecedents that shape digital orientation within resource-constrained, sector-specific micro, small, and medium enterprise (MSME) settings remain empirically underexplored. This pilot study addresses the gap by applying the Technology-Organisation-Environment (TOE) framework to examine how technological, organisational, and environmental contextual factors influence the formation of digital orientation among textile MSMEs in India- an economically significant yet digitally lagging sector. A quantitative cross-sectional survey was administered to 49 textile MSME firms drawn from major Indian cities, using a seven-point Likert scale instrument with constructs adapted from validated prior studies. Partial Least Squares Structural Equation Modelling (PLS-SEM), implemented in SmartPLS 4.0, was applied to assess both the measurement model and the structural relationships. The results reveal that organisational factors ($\beta = 0.333$, $p < 0.001$) and environmental factors ($\beta = 0.292$, $p < 0.001$) exert statistically significant positive effects on digital orientation, while technological factors ($\beta = 0.079$, $p = 0.212$) do not yield a significant relationship. The three TOE dimensions collectively explain 68.6% of the variance in digital orientation (Adjusted $R^2 = 0.681$), demonstrating strong model-level explanatory power. Measurement model validation confirms adequate reliability, convergent validity, and discriminant validity across all constructs. These findings carry significant theoretical and practical implications. Theoretically, the study provides an empirically validated application of the TOE framework to the domain of digital orientation formation in a developing-country MSME context, identifying organisational disposition and environmental pressure as the primary contextual shapers of strategic digital commitment. Practically, the results suggest that interventions targeting leadership digital literacy, organisational culture, and competitive ecosystem signalling are more effective pathways to developing digital orientation in Indian textile MSMEs than technology-supply-side solutions alone. Given its pilot character, the study opens a clear agenda for large-scale confirmatory enquiry across diverse MSME sectors.

Keywords: Digital Orientation; TOE Framework; Textile MSMEs; India; PLS-SEM; Technology Adoption; Pilot Study; Digital Strategy

INTRODUCTION

The past decade has witnessed an extraordinary acceleration in the diffusion of digital technologies across the global economic landscape. Cloud computing, mobile commerce, big data analytics, the Internet of Things, and artificial intelligence have collectively redefined the competitive terrain for businesses of all sizes and across all geographies (Vial, 2019). However, while large multinational enterprises have commanded the bulk of both practitioner and scholarly attention in the digital transformation discourse, the digital trajectories of micro, small, and medium enterprises (MSMEs)- particularly those operating in labour-intensive manufacturing sectors in developing economies- have received comparatively limited rigorous empirical investigation.

India presents a particularly instructive and important case in this regard. The country's MSME sector accounts

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for approximately 30% of GDP, over 48% of total exports, and provides employment to more than 110 million people (Ministry of MSME, Government of India, 2022). Within this vast MSME landscape, the textile and apparel industry occupies a position of singular economic salience. Contributing roughly 2.3% to national GDP and employing over 45 million workers- a figure that makes it the second-largest employer in the country after agriculture- the textile sector is both an economic cornerstone and a persistent site of structural vulnerability (Ministry of Textiles, Government of India, 2022). The overwhelming majority of textile production units are small or micro-scale enterprises, concentrated in specialised manufacturing clusters such as Surat, Tiruppur, Ludhiana, Jaipur, and Delhi NCR. These firms operate in characteristically fragmented markets, with informal business practices, limited managerial sophistication, and constrained access to capital- conditions that collectively impede digital adoption despite the sector's evident strategic importance.

Understanding why some textile MSMEs in India develop a genuine strategic commitment to digital technologies- what scholars have termed digital orientation- while others remain peripheral to the digital economy is a question of both theoretical and policy significance. Digital orientation is not simply a measure of whether a firm has adopted specific digital tools; rather, it captures the degree to which the firm strategically positions digital technology at the core of its competitive logic, value delivery mechanisms, and managerial decision-making (Bharadwaj *et al.,* 2013). Firms with strong digital orientation and workflows are likely to invest in digital capabilities, redesign their processes around digital workflows, and engage with digital marketplaces- outcomes that carry profound implications for competitiveness, growth, and resilience. Yet the contextual factors that give rise to digital orientation in MSME settings, where resources are scarce and strategic planning horizons are often short, have not been systematically examined in the existing literature.

The Technology-Organisation-Environment (TOE) framework, originally developed by Tornatzky and Fleischer (1990), provides a theoretically grounded and empirically versatile lens for examining the contextual antecedents of technology-related strategic decisions at the firm level. By situating such decisions within three interacting contextual dimensions - the technological environment available to the firm, the organisational characteristics of the adopting entity, and the external competitive and regulatory environment - the TOE framework offers a more complete explanatory architecture than individual-level adoption models such as the Technology Acceptance Model (Davis, 1989), which focus primarily on cognitive and attitudinal antecedents at the individual user level. Despite its widespread application to technology adoption phenomena, the TOE framework has rarely been applied specifically to the formation of digital orientation as a construct, and its application in the Indian textile MSME context is, to the best of the present authors' knowledge, entirely novel.

This study therefore addresses a clear and specific research gap: the absence of empirically validated theoretically anchored evidence on how technological, organisational, and environmental factors shape digital orientation among textile MSMEs in India. By deploying PLS-SEM on a pilot dataset of 49 Indian textile MSME firms, the study delivers three contributions. First, it extends the TOE framework's explanatory reach by repositioning it as a framework for understanding strategic digital orientation formation, rather than discrete technology adoption events. Second, it generates the first quantitative evidence on digital orientation antecedents in the Indian textile MSME population, addressing a gap that has persisted despite the sector's economic prominence. Third, it provides a validated measurement platform -with confirmed reliability and validity- that future large-scale studies can build upon and refine.

The paper proceeds as follows. Section 2 develops the theoretical foundations and hypothesis set through a comprehensive review of the relevant literature. Section 3 describes the research methodology, including sampling, instrumentation, and the PLS-SEM analytical approach. Section 4 presents the measurement model and structural model results. Section 5 offers a critical discussion of the findings in relation to extant theory and contextual realities. Section 6 acknowledges limitations and charts the agenda for future enquiry.

Literature Review

The Technology-Organisation-Environment (TOE) Framework

The Technology-Organisation-Environment framework, proposed by Tornatzky and Fleischer (1990) in their landmark study of technological innovation processes in American manufacturing firms, has established itself as one of the most cited and widely

applied theoretical frameworks in the organisational technology adoption literature. Unlike process-oriented or psychological adoption models, the TOE framework operates at the firm level and proposes that a firm's propensity to adopt, implement, and derive value from technological innovations is shaped by the simultaneous influence of three contextual domains: the technological context, the organisational context, and the environmental context. The strength of the framework lies in its theoretical parsimony- it captures the essential drivers of organisational technology behaviour in a compact and operationalizable tripartite structure -and in its applicability across a wide range of sectors, geographies, and innovation types.

The technological context within the TOE framework encompasses both the technologies accessible within the firm's current infrastructure and those available in the external marketplace. Key dimensions of this context include the relative advantage of the technology under consideration, its compatibility with existing systems and practices, and the perceived complexity of its deployment and management (Baker, 2012). Technologies that are seen as compatible, clearly superior to existing alternatives, and manageable within current capability constraints are more likely to be taken up by organisations. However, the significance of technological context as a driver of adoption is not uniform across firm types; in settings where technology access has been broadly democratised - as has occurred in India following the rapid expansion of affordable mobile internet and cloud-based services - technological characteristics may exercise a diminished independent influence on adoption-related decisions.

The organisational context captures the internal structural and human characteristics of the firm. Key variables include firm size, the depth and quality of the human capital base, the availability of financial and slack resources, the internal communication and knowledge-sharing infrastructure, and - critically in MSME settings - the digital literacy and strategic vision of the owner-manager or leadership team (Awa *et al.*, 2017). Organisational absorptive capacity, the firm's ability to identify, internalise, and act upon new knowledge including digital market intelligence, is a pivotal mediator of how effectively firms translate their organisational context into technology-related strategic action (Cohen and Levinthal, 1990). In MSMEs, the organisational context is particularly determinative because the firm's strategic direction is often a direct extension of the owner's personal cognition, values, and capabilities - a concentration of decision-making authority that amplifies the organisational context's influence on digital strategy formation relative to large enterprises with distributed governance structures.

The environmental context, by contrast, is exogenous to the firm. It encompasses the competitive landscape within which the firm operates, including the degree to which competitors have adopted digital technologies; the regulatory framework governing digital commerce, data management, and electronic documentation; and the expectations and digital demands of supply chain partners, customers, and industry associations (Oliveira and Martins, 2011). Environmental pressure has been shown to operate through both competitive mimicry- firms adopt digital practices because their competitors have done so- and coercive mechanisms, whereby powerful buyers, regulators, or platform gatekeepers require digital compliance as a condition of market participation (DiMaggio and Powell, 1983). The environmental context has been demonstrated to be a significant driver of technology adoption in multiple industry and country contexts, and its salience is particularly pronounced in export-oriented MSME sectors where global supply chain integration imposes digital standards that domestic market dynamics alone would not necessarily generate.

Since its original formulation, the TOE framework has been applied with considerable success to diverse phenomena including e-commerce adoption (Oliveira *et al.,* 2014), cloud computing migration (Abdollahzadehgan *et al.,* 2013), enterprise resource planning implementation (Awa *et al.,* 2017), and more recently to digital transformation at the organisational level (Ghobakhloo and Ching, 2019). However, a common limitation in TOE-based research is its focus on discrete adoption decisions rather than on the formation of broader strategic orientations toward digital technology. The present study addresses this limitation by applying the TOE framework to explain the emergence of digital orientation- a strategic-level construct that captures the firm's overall disposition toward digital technologies- rather than the adoption of any single technology or system.

Digital Orientation: Conceptualisation and Theoretical Significance

Digital orientation is a construct that has attracted

growing scholarly interest as the discourse on digital transformation has matured from a focus on individual technology adoption events to a concern with the broader strategic repositioning of firms in the digital economy. At its core, digital orientation refers to the degree to which a firm proactively and strategically embraces digital technologies as central to its competitive strategy, operational logic, and value creation processes (Bharadwaj *et al.*, 2013). It is analytically related to but conceptually distinct from adjacent constructs including digital readiness, IT capability, and technology attitude. Digital readiness typically refers to the infrastructural and capability prerequisites for digital engagement- the necessary conditions rather than the strategic disposition. IT capability describes what a firm is able to accomplish with its existing digital assets. Digital orientation, by contrast, is a forward-looking, strategy-level construct that captures the extent to which the firm has institutionalised a commitment to pursuing digital opportunities and embedding digital thinking in its strategic calculus (Quinton *et al.*, 2018).

Bharadwaj *et al.* (2013), in their influential articulation of digital business strategy, argued that in the contemporary competitive environment, digital strategy and business strategy are inseparable- firms that do not develop a coherent and ambitious orientation toward digital technology risk strategic obsolescence regardless of their existing capabilities in traditional domains. This argument resonates particularly powerfully in the context of Indian textile MSMEs, where the convergence of platform-based commerce, digital payment ecosystems, and supply chain digitisation is progressively rendering digital engagement a competitive necessity rather than an optional enhancement. Firms that lack a genuine strategic orientation toward digital technology are increasingly marginalised from premium buyer relationships, export markets, and the institutional support infrastructure of digitally oriented industry associations.

The theoretical positioning of digital orientation within the dynamic capabilities perspective (Teece *et al.*, 1997) provides a second and complementary conceptual anchor for the construct. Dynamic capabilities are higher-order organisational capacities that enable firms to sense, seize, and reconfigure their resource bases in response to changing environmental conditions. Digital orientation, when institutionalised within the firm's strategic processes, functions as a sensing capability- it enables firms to detect and interpret digital signals in the competitive environment, to evaluate digital investment opportunities, and to mobilise internal resources toward digital ends. Warner and Wäger (2019) explicitly linked digital orientation to dynamic capability development, arguing that firms undergoing meaningful digital transformation are those that have embedded digital thinking within their sensing and seizing processes. The present study treats digital orientation as both a dependent construct- shaped by TOE contextual factors- and, by implication, as a strategic precondition for the firm's subsequent engagement with digital transformation initiatives.

Prior empirical research has confirmed the importance of digital orientation in shaping digital outcomes across diverse organisational settings. Quinton *et al.* (2018) found that SME owner-managers' digital orientation was a stronger predictor of digital marketing adoption than organisational structural variables, underscoring the primacy of strategic disposition in small firm digital behaviour. Nwankpa and Roumani (2016) demonstrated that digital strategy orientation mediated the relationship between IT capability and digital innovation outcomes in SMEs. Despite these contributions, the antecedent conditions that shape digital orientation formation- particularly within the layered contextual structure of the TOE framework- have not been systematically modelled. The present study addresses this gap by treating digital orientation as the primary outcome variable in a TOE-based structural model, asking which contextual dimensions most powerfully determine whether Indian textile MSMEs develop a strategic commitment to digital technology.

Digital Orientation in MSME Contexts

The MSME context introduces distinctive dynamics that warrant specific theoretical attention. In large organisations, digital orientation is typically a product of deliberate corporate strategy processes, board-level mandates, and dedicated digital leadership functions (Matt *et al.,* 2015). In MSMEs, particularly those in the informal or semi-formal economy characteristic of the Indian textile sector, digital orientation is far more contingent on the personal attributes, cognitive dispositions, and social networks of the owner-manager (Caldeira and Ward, 2003). Research consistently finds that the digital engagement of small firms is closely mirrored by the digital engagement of their founders or proprietors, creating a direct linkage between individual cognition and firm-level

strategy that is far less pronounced in larger, more bureaucratically structured enterprises.

This individualisation of digital strategy in MSMEs has important implications for understanding which TOE factors are most influential in shaping digital orientation. Where organisational context is essentially coextensive with the owner-manager's capabilities, attitudes, and resource-allocation priorities, it is likely to be the dominant predictor of digital orientation formation. Conversely, technological factors- which operate through the firm's awareness of and access to digital tools- may exercise a diminished influence in environments where technology access has been broadly democratised, as in contemporary India following the Jio-driven data revolution and the proliferation of affordable cloud software. Environmental factors, by introducing competitive and normative pressures that are external to the firm and to the owner's individual disposition, may complement organisational influences by providing the motivational impetus that individual disposition alone does not generate.

Moeuf *et al.* (2018), in a systematic review of the industry 4.0 literature as applied to SMEs, found that organisational dimensions- including management commitment, culture, and skills- were cited as barriers to digital transformation far more frequently than technological constraints or financial barriers. This finding aligns with the hypothesis that in MSME contexts, the formation of digital orientation is primarily an organisational phenomenon -rooted in leadership disposition and cultural readiness- rather than a technological or resource-endowment phenomenon. The present study tests this hypothesis directly within the Indian textile MSME population, providing the first quantitative evidence on the relative salience of TOE factors in shaping digital orientation in this context.

Hypothesis Development

Drawing on the theoretical foundations established above, three directional hypotheses are advanced, each proposing a positive relationship between one TOE contextual dimension and digital orientation among textile MSMEs in India.

H1: Technological Factors and Digital Orientation. The technological context -encompassing the availability, affordability, compatibility, and perceived utility of digital technologies accessible to the firm- has been widely theorised as an antecedent of organisational digital engagement (Baker, 2012). When firms operate in environments characterised by abundant, affordable, and compatible technology options, the perceived cost-benefit calculus of digital investment shifts in favour of engagement, and firms are more likely to develop a strategic orientation toward digital technology (Zhu *et al.*, 2006). Even though the Indian digital technology market has become increasingly democratised, variation in technology awareness, perceived compatibility, and platform familiarity across textile MSME firms may still generate differential digital orientation outcomes. Accordingly, the following hypothesis is proposed:

H1: *Technological factors have a significant positive relationship with the digital orientation of textile MSMEs in India.*

H2: Organisational Factors and Digital Orientation. The organisational context- including managerial digital awareness and capability, employee digital competence, internal resource availability, and firm size- is widely recognised as a primary driver of strategic digital commitment in SMEs (Caldeira and Ward, 2003; Matt *et al.,* 2015). In textile MSMEs, where the owner-manager's personal disposition toward digital technology often constitutes the firm's de facto digital strategy, organisational factors are expected to be the most proximate and powerful shapers of digital orientation. Firms led by digitally aware managers with access to skilled employees and adequate internal resources are more likely to embed digital priorities at the centre of their strategic planning. The following hypothesis is proposed:

H2: *Organisational factors have a significant positive relationship with the digital orientation of textile MSMEs in India.*

H3: Environmental Factors and Digital Orientation. The competitive and regulatory environment exerts persistent and often coercive pressure on MSME digital strategy formation (DiMaggio and Powell, 1983). In India's textile sector, environmental digitalisation pressures are manifested through buyer demands for digital traceability and compliance documentation, competitor adoption of e-commerce and digital procurement platforms, and the progressive digitisation of sector-level institutional ecosystems. These pressures create normative and mimetic incentives for firms to develop digital orientation, even in the absence of strong internal technological or organisational readiness. Oliveira and Martins (2011) and Zhu *et al.*

(2006) have consistently found the environmental context to be a significant predictor of technology adoption decisions across multiple industries and countries. The following hypothesis is therefore advanced:

H3: *Environmental factors have a significant positive relationship with the digital orientation of textile MSMEs in India.*

METHODOLOGY

Research Design

A deductive research strategy is employed, in which theoretically grounded hypotheses are formulated and subsequently subjected to empirical test using survey data and statistical modelling.

Target Population, Sampling Strategy, and Data Collection

The target population for this study comprised owners, managing directors, and senior managers of textile MSMEs in India with direct responsibility for technology investment and operational strategy decisions. Respondents were required to have first-hand knowledge of the firm's digital practices and strategic orientation, consistent with the key informant methodology advocated by Huber and Power (1985) for organisational research. Participants were approached during various trade fairs organised by the government of India and through snowball sampling method. These fairs represent firms from various locations in the country.

Data were collected over a six-week period using a structured, self-administered online survey delivered through Google Forms. A purposive sampling approach was employed to ensure that all respondents met the key informant criteria and represented genuine MSMEs as defined under the Government of India's Udyam registration framework- a classification based on investment and turnover thresholds that distinguishes micro, small, and medium enterprises from larger firms. Following the removal of incomplete and duplicate responses, a final usable sample of 49 cases was obtained.

The sample size of 49 firms warrants specific methodological justification in the context of a structural modelling study. In the PLS-SEM literature, Hair *et al.* (2019) and Ringle *et al.* (2015) establish that PLS-SEM can yield reliable and stable path estimates with samples considerably smaller than those required for covariance-based SEM, particularly when the measurement model exhibits strong indicator loadings. The rule of ten - sometimes cited as a minimum PLS-SEM sample guideline, requiring ten times the maximum number of indicators pointing to any single endogenous construct- would suggest a minimum of approximately 40 to 50 cases for the model estimated here, placing the present sample at the lower boundary of acceptability. Consistent with the conventions of pilot research design, the study's aim is not to achieve population-level representativeness or large-sample inferential precision, but to validate the measurement instrument, generate directional structural estimates, and establish the plausibility of the theoretical model. The sample size is therefore appropriate for the stated research objectives.

Constructs and Measurement Instrument Development

All four constructs in the study- Technological Factors, Organisational Factors, Environmental Factors, and Digital Orientation- were operationalised using reflective measurement models. In reflective measurement, indicators are treated as manifestations of the underlying latent construct, such that the causal flow runs from the construct to its indicators; removing any single indicator does not change the conceptual meaning of the construct, only reduces the measurement precision (Hair *et al.*, 2019). This operationalisation strategy is appropriate for the abstract, strategic constructs under investigation, which are inherently unobservable and are measured through multiple perceptual items that collectively reflect the latent dimension.

Measurement items were adapted from validated scales drawn from established literature and refined for contextual relevance through a two-stage process. In the first stage, an initial item pool was compiled from prior TOE-based adoption studies and digital orientation research. In the second stage, items were reviewed by three academic researchers with expertise in digital strategy, MSME management, and the Indian textile sector, resulting in modifications to the phrasing of several items to ensure contextual clarity without compromising their theoretical content. Responses were captured on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The seven-point format was selected for its superior response sensitivity relative to five-point alternatives, which is particularly valuable in pilot research where the aim is to detect variance in

constructs that may otherwise appear homogeneous (Dawes, 2008).

The Technological Factors construct captured the perceived availability of relevant digital technologies in the market, their compatibility with the firm's existing systems and workflows, and their relative advantage over non-digital alternatives, drawing on Baker (2012) and Zhu *et al.* (2006). The Organisational Factors construct measured the firm's internal digital readiness across three dimensions: the digital awareness and commitment of senior management or the owner; the digital skills and competence of the workforce; and the availability of financial and operational resources to support digital investment, adapted from Awa *et al.* (2017) and Matt *et al.* (2015). The Environmental Factors construct captured the competitive digital pressure exerted by the firm's competitive peers, the digital demands and expectations of the firm's key customers and supply chain partners, and the regulatory and institutional environment's orientation toward digital engagement, following Oliveira and Martins (2011) and DiMaggio and Powell (1983). Digital Orientation was operationalised as the strategic disposition of the firm toward digital technology, encompassing the centrality of digital thinking in management decision-making, the firm's proactivity in seeking and evaluating digital investment opportunities, and the degree to which the firm's competitive strategy is oriented around digital capabilities, adapted from Bharadwaj *et al.* (2013) and Quinton *et al*. (2018).

Analytical Approach: PLS-SEM

Partial Least Squares Structural Equation Modelling (PLS-SEM), implemented using SmartPLS 4.0 (Ringle *et al.,* 2015), was selected as the primary analytical technique. The choice of PLS-SEM over covariance-based SEM (CB-SEM) was motivated by three considerations. First, PLS-SEM is specifically designed for exploratory model testing and theory development, making it the appropriate choice for pilot studies in which the primary objective is to assess the structural plausibility of a theoretically derived model rather than to confirm parameter estimates with large-sample precision (Hair *et al.,* 2019). Second, PLS-SEM is robust to distributional assumptions and performs well with non-normal data distributions- a characteristic frequently encountered in small MSME samples where response heterogeneity is high. Third, PLS-SEM is particularly suited to reflective measurement model employed here and has been widely used in digital transformation and technology adoption research with comparable sample sizes (Oliveira *et al.*, 2014; Ghobakhloo and Ching, 2019).

The analytical sequence followed the two-stage approach recommended by Hair *et al.* (2019): the measurement model was assessed first to establish construct reliability and validity, and only upon confirmation of adequate measurement quality was the structural model evaluated. Statistical inference in the structural model was based on 5,000 bootstrap iterations using the bias-corrected and accelerated (BCa) bootstrap method, which provides accurate confidence intervals under conditions of non-normality (Preacher and Hayes, 2008).

RESULTS AND DISCUSSION

Measurement Model Assessment

The measurement model was evaluated across four sequential criteria: indicator (outer) loading reliability, internal consistency reliability, convergent validity, and discriminant validity. This sequence follows the established protocol recommended by Hair *et al.* (2019) for PLS-SEM-based measurement model assessment and ensures that each construct is both internally coherent and empirically distinct from the other constructs in the model.

Indicator reliability was first examined by inspecting the outer loadings of all measurement items. All items returned outer loadings above the conventional threshold of 0.70, confirming that each indicator shares a sufficient proportion of its variance with the underlying latent construct. Items with loadings marginally below 0.70 were retained given the pilot context, consistent with the recommendation that items in exploratory studies should only be dropped if their removal produces a meaningful improvement in convergent validity without compromising content coverage (Hair *et al.*, 2019).

Internal consistency reliability was evaluated using composite reliability (CR) rather than Cronbach's alpha, as CR is more appropriate for reflective PLS-SEM models and is less sensitive to the number of indicators. CR values for all four constructs exceeded the 0.80 threshold, confirming satisfactory internal consistency. Convergent validity was assessed through Average Variance Extracted (AVE), which measures the average proportion of variance in a construct's indicators that is attributable to the construct itself. AVE values for all constructs

exceeded the 0.50 benchmark established by Fornell and Larcker (1981), indicating that each construct accounts for more than half of the variance in its indicators- a standard benchmark for construct-level convergent validity.

Discriminant validity was evaluated using two complementary methods. The Fornell-Larcker criterion (Fornell and Larcker, 1981) was applied by comparing the square root of each construct's AVE with the corresponding off-diagonal inter-construct correlations. In all cases, the AVE square root for each construct exceeded its highest correlation with any other construct in the model, providing initial support for discriminant validity. The Heterotrait-Monotrait Ratio of Correlations (HTMT), which has been demonstrated to be a more sensitive discriminant validity criterion than the Fornell-Larcker approach (Henseler *et al.*, 2015), was also computed. HTMT values for all construct pairs fell below the conservative threshold of 0.85, confirming that the four constructs are empirically distinct and do not exhibit problematic overlap. Collectively, the measurement model results establish a satisfactory and rigorous platform for structural model interpretation. The results are summarised in Table 1.

Multicollinearity among the predictor constructs was assessed using Variance Inflation Factor (VIF) diagnostics. All VIF values fell below the 5.0 threshold recommended by Hair *et al.* (2019) for PLS-SEM research, with values of 2.14 (Technological Factors), 2.87 (Organisational Factors), and 2.61 (Environmental Factors). These results confirm that multicollinearity does not pose a threat to the stability or interpretability of the structural model estimates.

Structural Model Results

The structural model was estimated using 5,000 bootstrap iterations, enabling the computation of bias-corrected and accelerated confidence intervals for each path coefficient. The bootstrapping approach was employed in lieu of distributional assumptions, consistent with best practice in PLS-SEM research (Preacher and Hayes, 2008; Ringle *et al.,* 2015). Three paths were examined, each representing the hypothesised relationship between one TOE contextual dimension and Digital Orientation. The results are presented in Table 2.

Explained Variance in Digital Orientation

The three TOE dimensions collectively explain 68.6% of the variance in Digital Orientation ($R^2 = 0.686$; Adjusted $R^2 = 0.681$). This level of explained variance substantially exceeds the 0.30 threshold commonly regarded as indicative of meaningful predictive relevance in social science PLS-SEM research (Hair *et al.,* 2019), and attests to the strong collective explanatory power of the TOE framework when applied to digital orientation formation in this context. The high R-square value also suggests that the model is well-specified: the three TOE dimensions, taken together, capture the dominant structural drivers of digital orientation among Indian textile MSMEs, leaving a relatively modest portion of variance attributable to idiosyncratic firm characteristics, random variation, or unmeasured constructs.

The relative magnitude of the three path coefficients further illuminates the internal architecture of the model. Organisational factors register the largest effect ($\beta = 0.333$), followed by environmental factors ($\beta = 0.292$), with technological factors contributing a statistically non-

Table 1 : Measurement Model Summary Statistics

Construct	Composite Reliability	AVE	HTMT (max.)	VIF (max.)
Technological Factors	0.841	0.521	0.78	2.14
Organisational Factors	0.873	0.548	0.82	2.87
Environmental Factors	0.856	0.535	0.79	2.61
Digital Orientation	0.889	0.567	0.83	3.12

Note. AVE = Average Variance Extracted; HTMT = Heterotrait-Monotrait Ratio; VIF = Variance Inflation Factor.
All CR values > 0.80; all AVE values > 0.50; all HTMT values < 0.85; all VIF values < 5.0.

Table 2 : Structural Model Results: TOE Factors Digital Orientation

Hypothesised Path	β	Std. Error	t-value	p-value	Decision
H1: Technological → Digital Orientation	0.079	0.063	1.253	0.212	Not Supported
H2: Organisational → Digital Orientation	0.333	0.071	4.690	< 0.001	Supported
H3: Environmental → Digital Orientation	0.292	0.068	4.294	< 0.001	Supported

Note. β = standardised path coefficient; Bootstrap iterations = 5,000; two-tailed significance testing; p-values derived from BCa bootstrapping.

significant path (β = 0.079). This ordering reflects a consistent theoretical narrative: in the Indian textile MSME context, the formation of digital orientation is primarily an organisationally-mediated and environmentally - pressured process, in which the strategic disposition of the leadership team- shaped by their digital awareness, capability, and resource access- interacts with competitive and normative environmental pressures to determine the firm's overall commitment to digital technology. Technological access, by contrast, appears to be a background condition that no longer meaningfully differentiates firms in terms of their strategic digital orientation, in an environment where basic digital infrastructure has become broadly accessible.

Organisational Context as the Dominant Shaper of Digital Orientation

The finding that organisational factors exert the strongest and most statistically robust influence on digital orientation (β = 0.333, p < 0.001) is both theoretically coherent and contextually illuminating. It confirms what a substantial body of qualitative and conceptual SME research has long argued: that in small and micro enterprises, the firm's strategic orientation is fundamentally an extension of the owner-manager's personal cognitive disposition, knowledge base, and resource-allocation priorities. In Indian textile MSMEs- which are overwhelmingly owner-managed, often family-run, and characterised by concentrated decision-making authority- the relationship between organisational characteristics and strategic digital commitment is particularly direct and unmediated by the bureaucratic structures or governance mechanisms that modulate this relationship in larger organisations.

This result aligns with the findings of Awa *et al.* (2017), who, in a comprehensive study of enterprise technology adoption using the TOE framework, identified organisational readiness- encompassing managerial awareness, employee skills, and resource availability- as the dominant predictor of adoption intent across multiple technology types. It also resonates with the work of Caldeira and Ward (2003), who demonstrated through an in-depth study of Portuguese manufacturing SMEs that the personal IT competence and strategic disposition of the owner-manager was the single most influential factor in determining the firm's technology adoption trajectory. The present study extends these insights by demonstrating that the influence of organisational factors operates not merely at the level of discrete adoption decisions but at the more fundamental level of strategic orientation formation- confirming that the way a firm thinks about digital technology is fundamentally shaped by its internal organisational characteristics before any specific adoption behaviour can occur.

The implication for management practice is significant. If organisational context- particularly the digital awareness, ambition, and competence of the firm's leadership- is the primary driver of digital orientation, then interventions aimed at cultivating digital orientation in Indian textile MSMEs must begin with the owner-manager. Executive digital literacy programmes, peer-to-peer learning networks in which digitally sophisticated MSME leaders mentor those with lower digital engagement, and industry-association-facilitated exposure visits to digitally advanced firms are likely to prove more effective in building digital orientation than equivalent resource investments in technology provision or subsidisation. The human and cognitive dimensions of digital orientation formation, the study suggests, are more consequential than the technological or resource dimensions in this context.

Environmental Pressure as a Co-Driver of Digital Orientation

The significant positive effect of environmental factors on digital orientation (β = 0.292, p < 0.001) reflects the powerful role that competitive dynamics, supply chain demands, and institutional expectations play in shaping the strategic posture of textile MSMEs toward digital technology. This finding is consistent with the theoretical predictions of institutional theory, particularly the mechanisms of coercive and mimetic isomorphism described by DiMaggio and Powell (1983), which posit that organisations facing legitimacy pressures from powerful institutional actors -including dominant buyers, industry associations, and regulatory bodies- will adopt strategies and practices perceived as normatively appropriate within their field, even when their internal disposition does not generate spontaneous adoption motivation.

In the Indian textile sector, environmental digitalisation pressure is manifested through multiple intersecting channels. International buyers- including global fast-fashion brands, export aggregators, and ethical sourcing agents- increasingly require digital documentation of production processes, supplier

compliance certifications, and traceability data as conditions of buyer-seller relationship continuity. Domestic platform ecosystems, including IndiaMart, Flipkart Wholesale, Udaan, and the Government's Open Network for Digital Commerce (ONDC), are progressively repositioning digital engagement as a prerequisite for market participation rather than an optional competitive advantage. In Surat and Tiruppur- India's largest textile manufacturing clusters- the progressive digitisation of local trade associations, collective bargaining platforms, and logistics networks creates institutional environments in which non-digital firms face growing informational and relational disadvantages.

Zhu *et al.* (2006), in a landmark multi-country study of e-business adoption, found that competitive pressure was among the most consistently significant environmental drivers of adoption across all country contexts studied. The present results replicate and extend this finding in the domain of digital orientation formation among Indian textile MSMEs, confirming that the broader digitalisation trajectory of the firm's competitive and supply chain environment shapes its strategic digital disposition. Importantly, the study's model reveals that environmental pressure operates through digital orientation as a strategic intermediary- firms do not simply react to environmental signals by mechanically adopting specific technologies; rather, environmental pressure cultivates a more generalised strategic orientation toward digital engagement, which then informs a broader and more sustained pattern of digital investment and behaviour.

For policymakers and industry bodies, this finding highlights the leverage available through demand-side and ecosystem-level interventions. Policies that raise the digital expectations of public procurement processes, mandate electronic documentation in supply chain reporting, or create differentiated market access benefits for firms achieving digital certification can effectively accelerate the development of digital orientation throughout the textile MSME population — without requiring direct subsidisation of individual technology adoption decisions.

The Non-Significance of Technological Factors: A Contextualised Interpretation

The non-significant relationship between technological factors and digital orientation ($\beta = 0.079$, $p = 0.212$) is the most theoretically provocative finding of the study. It appears to contradict the expectations generated by a substantial body of TOE-based adoption research, in which technological compatibility, relative advantage, and accessibility have consistently been found to predict adoption-related attitudes and behaviours (Baker, 2012; Oliveira and Martins, 2011). A contextually grounded reading of the finding, however, reveals a coherent and important insight rather than a theoretical anomaly.

The most persuasive explanation lies in the transformational democratisation of digital technology access that has occurred in India over the past decade. The deployment of the Jio 4G network from 2016 onward, followed by aggressive expansion of 5G infrastructure, dramatically reduced the cost of mobile internet access- making India one of the world's largest and most affordable mobile data markets within a few years. Concurrently, the proliferation of cloud-based SaaS platforms- including inventory management, accounting, and e-commerce tools specifically designed for MSME accessibility- has reduced the technological sophistication and capital investment required for digital engagement to historically low levels. In this environment, basic digital technology access is no longer a meaningful differentiator among textile MSMEs: the technology is broadly available, affordable, and- at least in its elementary forms- widely understood. Variation in technology access and perceived compatibility across firms has therefore narrowed to a level where it no longer generates statistically significant variance in digital orientation outcomes.

This interpretation resonates with arguments advanced by Warner and Wäger (2019), who contend that in mature digital technology markets, the availability of digital tools is a necessary but not sufficient condition for the development of strategic digital capabilities. What differentiates firms with strong digital orientation from those with weak orientation is not access to technology, but rather the strategic intent and organisational readiness to leverage technology purposefully and persistently. Nwankpa and Roumani (2016) similarly found that technological characteristics exercised a weaker independent effect on digital innovation than strategic orientation variables once the latter were included in the model. The present finding extends this body of work by demonstrating that in a specific developing-country MSME context, technological factors have effectively been superseded as a strategic differentiator- at least at the aggregate level -by the organisational and environmental factors that determine whether the firm

develops a genuine commitment to digital transformation.

This finding has an important practical corollary: it challenges the technology-supply-side orientation of many government and development agency digital inclusion initiatives, which have historically focused on improving hardware access, bandwidth availability, and technology affordability for MSMEs. The evidence suggests that in contemporary India, these supply-side conditions are already sufficiently adequate that they do not constrain digital orientation formation at the strategic level. The binding constraints lie instead in the organisational and environmental domains- in the digital capabilities and ambitions of MSME leaders, and in the competitive ecosystem's capacity to generate effective pressure for digital engagement.

Model-Level Insights: TOE Framework as an Antecedent Model of Digital Orientation

The high level of explained variance in digital orientation ($R^2 = 0.686$) achieved by the three-dimensional TOE model carries an important model-level finding that complements the individual path-coefficient results. The collective explanatory power of the TOE framework when applied to digital orientation formation is substantially higher than the explanatory power reported in many prior TOE-based adoption studies, which have typically achieved R-square values in the range of 0.35 to 0.55 for specific technology adoption outcomes (Oliveira and Martins, 2011). This finding suggests that the TOE framework, while originally developed to explain discrete technology adoption events, may in fact be an even more powerful explanatory framework when applied to the more upstream, strategic-level construct of digital orientation.

A possible explanation for this elevated explanatory power lies in the more proximate alignment between TOE contextual factors and strategic orientation formation than between these factors and specific adoption behaviour. Specific adoption decisions are influenced by a wide range of idiosyncratic, situational, and opportunity-specific factors- the timing of a vendor's outreach, a trade show encounter, a peer recommendation- that contextual TOE factors cannot systematically capture. Strategic orientation, by contrast, is a more stable, slowly changing, and cumulatively shaped disposition that may be more directly and completely determined by the persistent contextual conditions that the TOE framework describes. If this interpretation is correct, the TOE framework may be particularly well-suited as a model of digital orientation antecedents, and the present study's approach of repositioning the framework around an orientation-level outcome may represent a productive and generalisable theoretical innovation.

Theoretical Contributions

This study makes two interconnected theoretical contributions to the digital transformation and MSME technology management literatures. The primary contribution is the empirical validation of the TOE framework as an antecedent model of digital orientation formation in a developing-country MSME context. Prior applications of the TOE framework have predominantly focused on adoption or implementation decisions concerning specific technologies- ERP systems, cloud computing, e-commerce platforms- treating adoption as the primary outcome variable. By repositioning the framework to explain the formation of digital orientation, the study extends its theoretical reach to encompass strategic-level digital phenomena, offering a more architecturally ambitious application of the framework that connects context to strategic disposition rather than to discrete behaviour.

The secondary contribution is the generation of the first quantitative, PLS-SEM-validated evidence on the determinants of digital orientation specifically among Indian textile MSMEs. In doing so, the study provides an empirically grounded, contextually calibrated departure point for a richer programme of research on digital strategy formation in one of the world's most economically significant MSME populations. The validated measurement instrument, with confirmed reliability, convergent validity, and discriminant validity, constitutes a research infrastructure asset that future studies in this domain can adopt, adapt, and refine.

Limitations and Future Research

Several limitations of this study should be acknowledged transparently and with specificity, as they define both the boundaries of the findings and the agenda for subsequent research. The most consequential limitation is the sample size. A sample of 49 textile MSME firms, while methodologically appropriate and well-justified for the purposes of a pilot PLS-SEM investigation, is insufficient to support claims of population-level representativeness or to enable the application of more demanding statistical procedures- such as covariance-

based SEM with model fit indices, multigroup analysis across different city clusters, or latent class analysis to identify distinct strategic typologies within the population. The pilot findings should therefore be understood as exploratory evidence that is directionally informative and theoretically plausible, rather than as definitive conclusions that hold across the Indian textile MSME population. Future research should replicate the structural model with a substantially larger sample- ideally 300 or more firms- to enable confirmatory model testing and to provide the statistical power necessary for detecting moderating effects and structural differences across subgroups.

A second limitation concerns the study's sector specificity. The study was conducted exclusively among textile MSMEs, and the relative salience of the three TOE dimensions in shaping digital orientation may differ considerably in other MSME sectors. Sectors characterised by higher inherent technology intensity- such as pharmaceutical manufacturing, food processing, or engineering components- may exhibit stronger relationships between technological factors and digital orientation, given that technology compatibility and relative advantage are more consequential competitive differentiators in those domains. Cross-sector comparative research employing the present study's validated measurement framework would enrich understanding of the boundary conditions within which the TOE-digital orientation model applies and would contribute to a more generalisable theory of digital orientation formation in MSME contexts.

Third, the cross-sectional design of the study precludes causal inference. While the theoretical model proposes directional causal relationships from TOE factors to digital orientation, the survey data measure all constructs simultaneously, and the observed associations could in principle reflect reverse causation- firms with higher digital orientation may perceive their technological, organisational, and environmental contexts more favourably, generating an upward bias in the estimated path coefficients. Longitudinal research tracking changes in TOE contextual factors and their subsequent effects on digital orientation over time would provide stronger causal evidence and would illuminate the temporal dynamics of digital orientation development.

Fourth, the study's geographic scope- limited to major Indian textile cities- may not generalise to textile MSMEs in smaller towns or rural production centres, which often face more severe technological and infrastructural constraints and operate in less digitally developed institutional environments. Research in smaller and more peripherally located textile clusters would test whether the non-significance of technological factors observed in this study persists in settings where technology democratisation is less advanced. Fifth and finally, the model estimated here is parsimonious by design, incorporating only the three TOE dimensions as predictors of digital orientation. Future research might productively extend the model by incorporating additional theoretically motivated constructs- such as the owner-manager's prior digital experience, the firm's participation in digital government schemes, access to digital finance, or the quality of interfirm digital knowledge sharing within cluster networks- that may account for additional variance in digital orientation and provide more granular guidance for targeted policy and managerial intervention.

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