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Mechanism of Technology-Organisation-Environmental Factors on Digital Transformation: A mediation approach with Knowledge Management

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ABSTRACT
Digital transformation has emerged as a critical strategic imperative for organizational sustainability and competitive advantage, particularly within the information technology sector, which operates in a highly dynamic and innovation-intensive environment. Despite extensive literature on digitalization, the complex interplay between technological, organizational, and environmental factors in facilitating digital transformation remains inadequately understood, especially regarding the mediating mechanisms that enhance transformation effectiveness. This study investigates how individual IT professionals perceive technological, organizational, and environmental determinants of digital transformation, emphasizing the mediating role of knowledge management. Employing a comprehensive quantitative methodology, the study collected data from 410 IT professionals in India and utilized Partial Least Squares-Structural Equation Modelling (PLS-SEM) for analysis. Findings reveal that organizational factors directly influence digital transformation implementation, while technological and environmental factors exert indirect effects through knowledge management as a significant mediating variable. The study contributes to both the theoretical understanding of digital transformation mechanisms and provides practical insights for IT organizations in India seeking to enhance their digitalization strategies through strategic knowledge management implementation, ultimately fostering innovation, operational efficiency, and sustainable growth in an increasingly digital business ecosystem**.**

Keywords: Technology, organization, environment, knowledge management, digital transformation, information technology.

1. INTRODUCTION:

The accelerated proliferation of Industry 4.0 technologies, ranging from artificial intelligence (AI) and the Internet of Things (IoT) to advanced analytics and automation, is fundamentally redefining contemporary business models, catalyzing profound digitalization across diverse sectors (Matarneh et al., 2024). Digital transformation is increasingly viewed not merely as technology adoption, but as the "strategic integration of digital technologies across all business domains, fundamentally altering operational mechanisms and value delivery systems" (Iivari et al., 2020, p. 218; Vial, 2019; Westerman et al., 2011). This paradigm shift has become a central imperative for achieving organizational sustainability, innovation, and lasting competitive advantage (Bharadwaj et al., 2013).

Recent evidence underscores the substantial acceleration of digital initiatives. For example, a global survey by Wolters Kluwer (Whybrow, 2025) found that 39% of internal auditors are already leveraging AI, and a further 41% expect to adopt AI within the next 12 months, projecting sector-wide adoption to reach 80% by 2026. Such statistics exemplify how organizations are compelled to reconceptualize their business models and processes in light of emerging digital opportunities and pressures. Industry analyses suggest that by 2026, over 60% of platform and product development teams across sectors will have integrated AI-based IT operations into their organizational workflows (Gartner, 2024), reflecting an industry-wide momentum toward intelligent automation and data-driven decision-making (IDC, 2024). The information technology (IT) sector, particularly in India, plays a uniquely dynamic role in this landscape. IT organizations in India operate both as frontrunners developing and early-adopting digital innovations, and as facilitators, enabling digital transformation across external industries (Rashid & Kausik, 2024; Javaid et al., 2024). This dual responsibility engenders complex transformation dynamics, where the sector is both an agent and subject of technological change. Additionally, the Indian IT sector is marked by pronounced knowledge intensity and rapid technological evolution; knowledge assets are the primary source of competitive differentiation (Du Plessis, 2007), and technology obsolescence rates are three times higher than in other sectors, compounding pressures around digital

transformation (Gagan Deep, 2023). Within this environment, Knowledge Management (KM) has emerged as an essential organizational capability enabling firms to systematically acquire, organize, and apply vast and fast-evolving knowledge resources to support innovation and operational agility (Maier & Remus, 2003; Wiig, 1997; Alavi & Leidner, 2001). Research shows that effective KM strongly correlates with innovation, process improvement, and organizational resilience in IT-intensive contexts (Du Plessis, 2007; Gong & Ribiere, 2021).

Despite the extensive application of the Technology-Organization-Environment (TOE) framework in research on digital transformation, much of the existing literature emphasizes the direct effects of technological, organizational, and environmental factors on digital transformation outcomes (Bany Mohammad et al., 2022; Li et al., 2023; Nguyen et al., 2022). In parallel, knowledge management has been widely recognized as essential for supporting digital initiatives, yet most studies consider it as either an independent enabler or an outcome, rather than rigorously examining its mediating role within the TOE–DT relationship (Maier & Remus, 2003; Wiig, 1997). As a result, the specific mechanisms through which knowledge management translates and channels the impact of technological, organizational, and environmental factors into effective digital transformation remain underexplored in the scholarly literature (Gangwar et al., 2015; T.H. Kim et al., 2014; Gong & Ribiere, 2021).

This limitation is especially evident in research focused on the IT sector, where the boundaries between technological capability, organizational processes, and environmental pressures are highly dynamic and interconnected (G. Gupta & Bose, 2022; Konopik et al., 2022). Few empirical studies have developed or tested integrated models that explicitly position knowledge management as a mediating construct within the TOE framework to explain digital transformation outcomes, particularly in emerging economies or knowledge-intensive industries. Therefore, a significant gap persists regarding the mechanisms by which technological, organizational, and environmental factors jointly influence digital transformation through knowledge management, justifying the need for a mediation approach as advanced in this study. Addressing this gap can clarify the underlying dynamics that determine digital transformation effectiveness and expand both theory and practice in digital innovation management. This research operationalizes these constructs and applies a survey-based quantitative methodology with data from 410 IT professionals. The sample reflects India's prominent position in the global IT services market, currently accounting for approximately 8% of worldwide share (G. Gupta & Bose, 2022; NASSCOM, 2024), bolstering the study's relevance and originality, especially considering much prior research's Western focus. Therefore, this research pursues three main objectives:

To assess the direct effects of technological, organizational, and environmental factors on digital transformation.

To examine the mediating effects of knowledge management in these relationships.

To develop an integrated conceptual model illuminating the mechanisms shaping digital transformation within the Indian IT sector.

This study significantly advances our understanding of the intricate interplay among Technology-Organization-Environment (TOE) factors, Knowledge Management (KM), and Digital Transformation (DT), offering both theoretical insights and actionable strategies for IT leaders and policymakers. The findings compellingly illustrate how integrated knowledge management strategies can enhance innovation outcomes, drive operational efficiency, and secure a sustained competitive advantage, especially in a landscape marked by constant sectoral evolution. By moving beyond a purely technology-centric focus, organizations are encouraged to adopt holistic frameworks that effectively leverage a fusion of technical, organizational, and knowledge resources. This comprehensive exploration reveals that for IT firms to thrive in an increasingly digitalized environment, strategizing the implementation of knowledge management is paramount. Such strategies not only optimize digital transformation initiatives but also elevate an organization's innovation capacity and operational efficacy.

Moreover, the study underscores the critical need for businesses to develop strong knowledge management capabilities as essential facilitators of successful digital transformation. The insights gleaned from this research emphasize the urgency for integrated approaches that concurrently address technological, organizational, environmental, and knowledge dimensions of digital transformation initiatives. In navigating the multifaceted challenges presented by today's dynamic business ecosystem, these findings provide a vital roadmap for organizations seeking to harness the full potential of digital transformation. By embedding robust knowledge management practices at the core of their strategies, organizations can position themselves not just to survive, but to lead in an era defined by rapid change and digital complexity.

Theoretical background and hypothesis formation

2.1 Knowledge-Based View Theory and TOE Framework

This study integrates the Knowledge-Based View (KBV) theory with the Technology-Organization-Environment (TOE) framework to develop a comprehensive model explaining digital transformation in IT organizations. KBV posits that organizational knowledge, both tacit and explicit, is the most strategically valuable resource that firms can leverage to create and sustain competitive advantage (Grant, 1996; Nonaka & Takeuchi, 1995). Effective knowledge management involves not only accumulating knowledge assets but also fostering dynamic knowledge flows that enable innovation and adaptation, reflecting "knowing how" and "knowing about" dimensions essential for digital transformation (Choi & Lee, 2012).The TOE framework complements this by examining three critical dimensions influencing

technological innovation adoption: technological, organizational, and environmental contexts (Tornatzky & Fleischer, 1990). This multidimensional approach is particularly advantageous for studying digital transformation, which requires the integration of complex technologies, supportive organizational structures, and alignment with external environmental pressures (Baker, 2012; Bharadwaj et al., 2013). Together, KBV and TOE provide a comprehensive lens for understanding the diverse factors shaping digital transformation outcomes in IT firms.

Extending traditional TOE applications, this study positions knowledge management as a central mediating mechanism linking TOE factors to digital transformation success. By enabling the creation, sharing, and application of both tacit and explicit knowledge, KM processes empower knowledge workers to transform organizational and environmental capabilities into effective digital initiatives (Bhatti et al., 2024; Gong & Ribiere, 2021). Empirical evidence supports KBV's role in aligning digital strategies with organizational knowledge assets, making KM the critical cognitive and structural infrastructure that facilitates the absorption, integration, and exploitation of resources necessary for sustained innovation and competitive advantage in IT industry digitalization (Bag & Pretorius, 2022; Upadhyay & Kumar, 2020).

2.1.1 Technological Factors

In this study, technological factors represent IT professionals' perceptions of their organization's technological infrastructure and adoption of emerging technologies. Items were adapted to capture individual-level views regarding the availability, usefulness, complexity, and relative advantage of organizational technology within their immediate work context (Gangwar et al., 2015; Ahmad et al., 2019). The rapid evolution driven by the internet has significantly shortened product life cycles, compelling organizations across sectors to continuously enhance their technological capabilities (Qalati et al., 2021). Previous research has identified various technological factors influencing digital transformation, including relative advantage (Ahmad et al., 2019), complexity (Tajudeen et al., 2018), perceived usefulness (Abed, 2020), and interconnectivity (Pateli et al., 2020). Technology plays an essential role in enhancing company performance and represents a fundamental factor contributing to organizational success (Brah & Ying Lim, 2006).

Additionally, technological factors crucially shape knowledge management by providing necessary tools and platforms for knowledge acquisition, storage, and dissemination (Soto-Acosta et al., 2018). Advanced technologies such as artificial intelligence, big data analytics, and cloud computing facilitate seamless knowledge-sharing across organizations, enhancing collaboration and decision-making processes (Intezari & Gressel, 2017; Saratchandra & Shrestha, 2022). A robust IT infrastructure ensures employees can efficiently access, retrieve, and apply knowledge, thereby improving organizational productivity. Gangwar et al. (2015) demonstrated that the relative advantages inherent in cloud computing contribute to significant outcomes, including enhanced customer service quality, increased efficiency in internal processes, elevated employee productivity, and decreased inventory expenses. Based on these arguments, we propose:

H1a: Technological factors positively influence digital transformation in IT organizations.

H1b: Technological factors positively influence knowledge management in IT organizations.

2.1.2 Organizational Factors

Organizational factors were operationalized as individual perceptions of organizational readiness, culture, management support, and structure. While theoretically grounded at the organizational level, all measures in this study reflect employees' subjective views of their work environment, aligning the operationalization with the individual unit of analysis (Chatterjee et al., 2021; Singh, 2008).The organizational dimension pertains to internal characteristics, including aspects like organizational type, size, staffing, employee count, degree of formalization or centralization in processes, and managerial considerations (Utterback, 1971). Previous research has identified various organizational factors influencing digital transformation, such as top management support (Grover & Goslar, 1993), organizational readiness (Chwelos et al., 2001), and technology competence (Wang et al., 2016).

Organizations with efficient infrastructure, skilled employees, and financial support enhance the efficacy of technological implementations (Gangwar et al., 2015). Rogers Everett, M. (1995) proposed that organizational resources substantially and positively influence innovative technology adoption within organizations, as supported by prior research (Chwelos et al., 2001; Fathian et al., 2008; Scupola, 2003). Firms with proactive and adaptive organizational cultures, characterized by openness to innovation, risk-taking, and continuous learning, tend to develop strong digital cultures (Wairimu et al., 2022). These organizations proactively invest in digital skills, encourage experimentation with emerging technologies, and integrate digital tools into everyday workflows.

Furthermore, the structural design of an organization, whether hierarchical or decentralized, influences knowledge flow across departments, with flexible and collaborative environments fostering knowledge-sharing behaviors (Willem & Buelens, 2009). Leadership commitment to knowledge initiatives significantly determines employee engagement in knowledge management practices (Singh, 2008). When organizational readiness is lacking, employees may experience limitations in effectively utilizing new technologies like AI, resulting in the inability to fully recognize their utility (Chatterjee et al., 2021). Based on these arguments, we propose:

H2a: Organizational factors positively influence digital transformation in IT organizations.

H2b: Organizational factors positively influence knowledge management in IT organizations.

2.2.3 Environmental Factors

Environmental factors were assessed through respondents' perceptions of external market trends, competitive pressures, regulatory support, and customer demands impacting their organization. Measuring these constructs as perceived by individuals reduces risk of cross-level inference and is consistent with similar approaches in organizational research (Asiaei & Ab Rahim, 2019; Gutierrez et al., 2015). It encompasses market dynamics and determinants derived from the external environment in which the company operates (Qalati et al., 2021). The environment can be characterized by various traits, including market trends, regulatory support, competitive pressure, customer pressure, and uncertainty (Abed, 2020; S. Z. Ahmad et al., 2019; Olanrewaju et al., 2020; Tajudeen et al., 2018).

Organizations must monitor and respond to current market trends to maintain a competitive advantage, which includes identifying emerging technologies, industry-specific innovations, and shifting consumer behaviors that may impact technology implementation decisions (Asiaei & Ab Rahim, 2019). Prior studies indicate that market dynamics and competitive pressure significantly influence technological transformation (S. Gupta et al., 2022; Hsing Wu et al., 2013; Wang et al., 2016; Wong et al., 2020). Market dynamics facilitate strategic decisions, help firms seize opportunities, and mitigate risks associated with implementing digital technologies (Wong et al., 2020).

Firms operating in rapidly evolving industries must continuously adapt their knowledge management strategies to remain competitive (Nonaka & von Krogh, 2009). Moreover, changes in government policies and compliance requirements compel organizations to develop structured mechanisms for knowledge acquisition and dissemination. Based on these arguments, we propose:

H3a: Environmental factors positively influence digital transformation in IT organizations.

H3b: Environmental factors positively influence knowledge management in IT organizations.

2.2.4 Knowledge Management and Digital Transformation

In this study, knowledge management practices refer to IT professionals' self-reported engagement in, and perceptions of, knowledge creation, sharing, and application within the organization. Items captured individual experiences of KM processes rather than collective or aggregated organizational outcomes (Alavi & Leidner, 2001; Gong & Ribiere, 2021). Through structured KM practices, IT firms can harness intellectual capital to foster innovation, enhance decision-making quality, and align technological initiatives with strategic objectives, thereby ensuring the effective adoption and integration of complex digital technologies (Choi & Lee, 2012; Pereira & Bamel, 2021). Knowledge workers, as active contributors to knowledge creation and dissemination, play a pivotal role in this process by mobilizing and applying organizational know-how essential for digital transformation success (Khaksar et al., 2023; Du Plessis, 2007).

Additionally, modern digital tools such as artificial intelligence, big data analytics, and cloud computing are substantially enhanced by KM's efficacy, facilitating seamless knowledge sharing, real-time collaboration, and improved access to relevant information across organizational boundaries. (Hoe, 2006; Sundaresan & Zhang, 2022). Organizations with strong KM capabilities can thus accelerate digital transformation by ensuring that knowledge flows are well-structured and accessible, reducing implementation risks and enhancing responsiveness to technological change (Marchena Sekli & De La Vega, 2021). In the highly knowledge-intensive IT context, robust KM infrastructure provides the necessary cognitive and structural foundation for absorbing, applying, and scaling digital innovations, positioning KM as a critical enabler that actively drives and shapes digital transformation outcomes (Gong & Ribiere, 2021; G. Gupta & Bose, 2022). Based on these arguments, we propose:

H4: Knowledge management positively influences digital transformation in IT organizations.

2.2.5 Mediating Role of Knowledge Management

Building on the established relationships between technological factors and both knowledge management and digital transformation, knowledge management serves as a critical mediating mechanism through which technological capabilities influence digital transformation outcomes. According to the Knowledge-Based View, technological assets play a pivotal role in driving innovation within companies and nurturing foundational competencies (Guo et al., 2020). Knowledge management translates these technological capabilities into digital transformation outcomes by facilitating the effective acquisition, assimilation, and application of technological knowledge throughout the organization.

Business services firms are primarily characterized by their reliance on knowledge as a central element of their operations, and a firm's technological expertise constitutes a substantial component of its knowledge reservoir (Zhou & Li, 2010). As organizations deploy new technologies, knowledge management processes ensure that the resulting insights are captured, codified, and distributed, thereby maximizing the transformative potential of these technological investments. Technologies can therefore be regarded as pivotal in the knowledge management process and significantly influence a business's success in digital transformation initiatives (Soto-Acosta et al., 2018).

H5: Knowledge management mediates the relationship between technological factors and digital transformation in IT organizations.

Organizational factors such as structure, culture, leadership, and support mechanisms shape the internal

environment necessary for digital transformation. However, these factors exert their influence on digital transformation primarily through knowledge management processes that enable effective creation, sharing, and utilization of knowledge aligned with organizational goals (Omar Sharifuddin Syed-Ikhsan & Rowland, 2004; Alavi & Leidner, 2001). A culture that encourages open communication and collaboration facilitates knowledge flows essential for learning and innovation, which are critical for adopting and integrating digital technologies (Levine, 2001; Choi & Lee, 2012).

Empirical studies confirm that without robust KM mechanisms, organizational factors may fail to translate into successful transformation outcomes (Gangwar et al., 2015; Marchena Sekli & De La Vega, 2021). KM acts as the vital intermediary infrastructure that harnesses organizational attributes to support decision-making, operational coordination, and innovation during digital transformation (Du Plessis, 2007; Gong & Ribiere, 2021). Thus, KM mediates the relationship by transforming organizational enablers into practical knowledge processes that facilitate the effective implementation of digital initiatives and improve transformation success.

H6: Knowledge management mediates the relationship between organizational factors and digital transformation in IT organizations.

Environmental factors such as competitive intensity, regulatory changes, and market volatility, pose external pressures that compel organizations to innovate and transform digitally (Tornatzky & Fleischer, 1990; Feroz et al., 2021). Knowledge management processes enable firms to systematically acquire, interpret, and apply this external knowledge by integrating market intelligence, regulatory requirements, and technological trends into organizational knowledge bases (Kabir, 2019; Du Plessis, 2007). This knowledge integration is crucial for informed strategic responses and agile digital transformation execution.

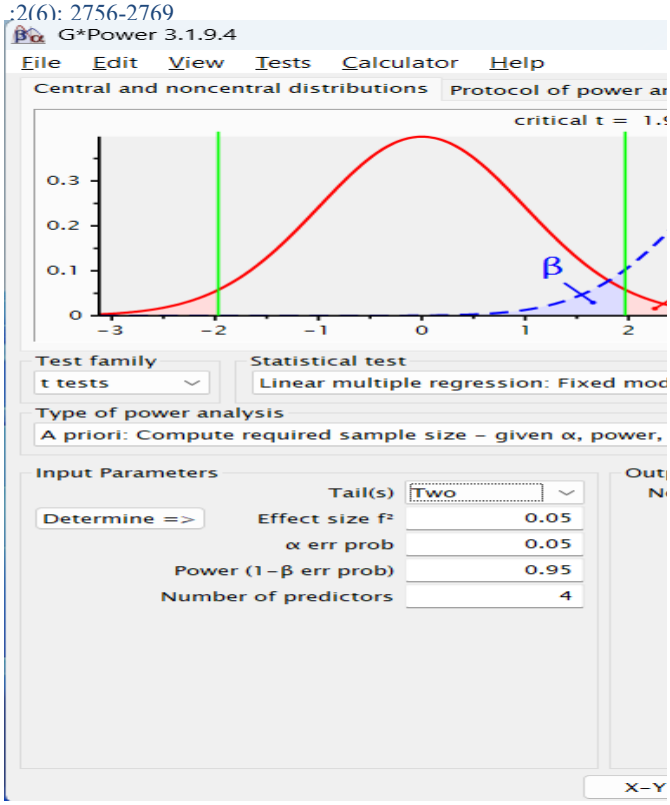
The knowledge-based view underscores that firms with superior KM capabilities are better positioned to translate environmental pressures into digital innovation and competitive advantage (Grant, 1996; Eisenhardt & Martin, 2000). Empirical evidence shows KM's mediating role in converting external environmental stimuli into actionable insights, shaping digital transformation strategies that enhance adaptability and performance (Nguyen et al., 2022; Marchena Sekli & De La Vega, 2021). Therefore, knowledge management serves as the critical bridge that transforms environmental challenges into opportunities through effective knowledge assimilation and application during digital transformation.

H7: Knowledge management mediates the relationship between environmental factors and digital transformation in IT organizations.

Methodology

According to Creswell et al. (2017), if the key objective of the research is to ascertain the relationship between constructs, a quantitative approach is the most suitable methodology. This study employs a deductive approach since its primary focus is to validate the hypotheses that have been derived from pre-existing theories (Bryman, 2007). Therefore, to confirm the hypothesis, the study employed the sample survey technique. A questionnaire, consisting of 38 scale items, was adopted from established literature and subsequently distributed among the respondents. All constructs, including technology, organization, environment, and knowledge management, were operationalized and measured strictly at the individual level. Respondents rated their perceptions, ensuring analytic coherence in line with best practices (Glick, 1985; Kind, 2025). Although some constructs originate at the organizational level, both sampling and empirical analyses are confined to individual-level inferences. We explicitly acknowledge that findings should not be generalized to the organizational level, and recommend future multi-level modeling for broader inference(Brewer & Venaik, 2014). Data were collected through an online self-administered questionnaire using a cross-sectional approach. This study employed convenience sampling due to practical constraints, recognizing its impacts on representativeness and potential for non-response bias (Andrade, 2021; Memon et al., 2023, Dwivedi etal.,2006). While statistical power is adequate by G*Power standards, generalizability beyond our sample is limited. The data for this research was collected from top IT organizations in India and from India's three major cities, i.e., Delhi, Bangalore, and Hyderabad, and the sample was drawn from software engineers, team leaders, and software developers. The questionnaire was segmented into two primary sections. The initial section collected personal information, including details such as name, gender, age, and designation. Meanwhile, the second section comprised various statements along with a rating scale to assess the adoption of digital technologies in IT industries. All constructs were assessed utilizing a five-point Likert scale, ranging from 1 "strongly disagree" to 5 "strongly agree". From June 2023 to November 2023, respondents were provided with a link to access the online survey questionnaire. To determine the required sample size, we conducted an a priori power analysis using GPower (Cohen, 1988). The fig-1 results indicate that for a linear multiple regression model with an effect size (f^2) of 0.05, $\alpha = 0.05$, power = 0.95, and four predictors, a minimum of 262 respondents is required. Our actual sample size of 410 exceeds this threshold, ensuring sufficient statistical power to detect meaningful effects. Therefore, the sample size used in the study is statistically adequate and enhances the reliability of the findings. To collect the data from the respondents, 685 potential respondents were contacted, and 509 participated in our survey. After addressing judgment errors, 99 responses were eliminated, and a total of 410 responses were considered and included in the analysis (Giner-Sorolla et al., 2024).

Fig-1: G*Power sample size determination



Source: Author's own

3.1 Measuring Instruments

To ensure contextual uniformity, this study has combined variables from existing literature, making slight modifications where necessary. A final survey questionnaire was reviewed by an expert to ensure overall consistency. The study included items that were relevant to the constructs being examined: Technological Factors, Organizational Factors, Environmental Factors, Knowledge Management, and Digital Transformation. In this study, constructs were specified reflectively as per theoretical support and empirical practice (Abed, 2020; Chatterjee et al., 2021; Singh et al., 2024). The technology scale consists of six items developed by Oliveira et al. (2014) and revised by Tiwari et al. (2023). The organizational factor scale includes nine items created by Chen et al. (2015) and modified by Maroufkhani et al. (2023). The environmental factor scale comprises six items developed by Wong et al. (2020). Additionally, the knowledge management scale contains twelve items formed by Zaim et al. (2019). Lastly, the digital transformation scale includes five items introduced by Nasiri et al. (2020). A complete list of items for all the measured variables can be found in Annexure 1.

Results

4.1 Descriptive Statistics

Upon initial examination of the results, it was found that the correlation coefficients among the study variables remained below 0.85, ranging from 0.47 to 0.75. This suggests the absence of multicollinearity concerns (Kline, 2005). To assess the robustness of the study, we employed the heterotrait-monotrait (HTMT) approach. The results indicated that the HTMT ratios among the variables did not exceed the threshold limit of 0.85 (Henseler, 2015). This confirms that the study variables are distinct from one another, and there are no issues with multicollinearity in this study. Nevertheless, we proceeded to conduct a multiple linear regression model to calculate the variance inflation factor for all constructs. The Variance Inflation Factor (VIF) values ranging from 1.09 to 2.83 in Table 1 are significantly lower than the conventional threshold of 5, suggesting the absence of multicollinearity issues with the independent variable (Pallant, 2005). Additionally, the VIF was found to be less than 3, indicating that the sample is free from common method bias (Kock, 2015). Hence, all variables were deemed suitable for inclusion in the Structural Equation Modelling analysis.

4.1.1 Measurement model assessment

The assessment of the measurement model occurred in two stages: first, confirmatory factor analysis was executed for each variable, followed by Confirmatory Factor Analysis (CFA) for the comprehensive measurement model, where all the primary latent constructs were correlated with one another. Following the recommendation by Hair et al. (2010), a combination of fit indices like the Normed Fit Index (NFI) and Root Mean Square Error of Approximation (RMSEA) was employed to evaluate the model fit (Table 1). The measurement model illustrates a good model fit with the data, i.e., $\chi 2/df=3.89$; NFI=0.91; RMSEA=0.068. Furthermore, both dULS (0.235 < 0.290) and dG (0.178 < 0.250) values fell below the bootstrap-based 95% quantiles, confirming that the model reproduces the empirical data structure well. Therefore, the model is statistically acceptable for hypothesis testing.

Table 2: Results of the SRMR, NFI, dULS, and dg for both the estimated and saturated models

Fit Index	Estimated Model	Saturated Model	95% Bootstrap Quantile	Inter
SRMR	0.068	0.000	NA	Good
NFI	0.910	0.950	NA	Acce (> 0.
d_ULS	0.235	0.000	0.290	Acce < 0.2
d_G	0.178	0.000	0.250	Acce < 0.2

Source: Author's own

Table 1: Correlation Table and Discriminant Validity

Latent Constructs	VIF	DT	EF	KM	OF	TF

DT	2.33	0.945	0.537	0.757	0.597	0.378
EF	2.16	0.500	0.751	0.632	0.651	0.509
KM	1.09	0.701	0.561	0.719	0.742	0.463
OF	1.83	0.559	0.571	0.669	0.761	0.573
TF	2.06	0.353	0.441	0.419	0.519	0.813

Source: Author's own

Note: The values of the diagonal cells (in bold and italics) represent the square root of the AVE values. The HTMT ratio values are located above the diagonal elements, while the correlations between latent constructs are found below them.

Further, the measurement model was evaluated to ensure the constructs' reliability and validity (Table-3), which are crucial steps in confirming the robustness of the research framework. Internal consistency reliability was first established through Cronbach's alpha (α) and composite reliability (rho_C). Most constructs demonstrated strong reliability, with α>0.7, aligning with the commonly accepted threshold (Hair et al., 2018). Constructs such as the Technological Factor (TF), Organizational Factor (OF), Environmental Factor (EF), and Knowledge Management (KM) displayed rho_c>0.8, underscoring high reliability (Bagozzi & Yi, 1988). Convergent validity, assessed via the Average Variance Extracted (AVE), was confirmed for most constructs, with AVE values exceeding the 0.5 benchmark, suggesting that the constructs adequately capture their respective latent variables (Fornell & Larcker, 1981). Discriminant validity, assessed through the Fornell-Larcker criterion, was also confirmed as the square root of the AVE for each construct exceeded the inter-construct correlations (Table-1). These findings confirm that the measurement model achieves the necessary reliability and validity to proceed with structural analysis.

Table 3: Measurement Model Criteria

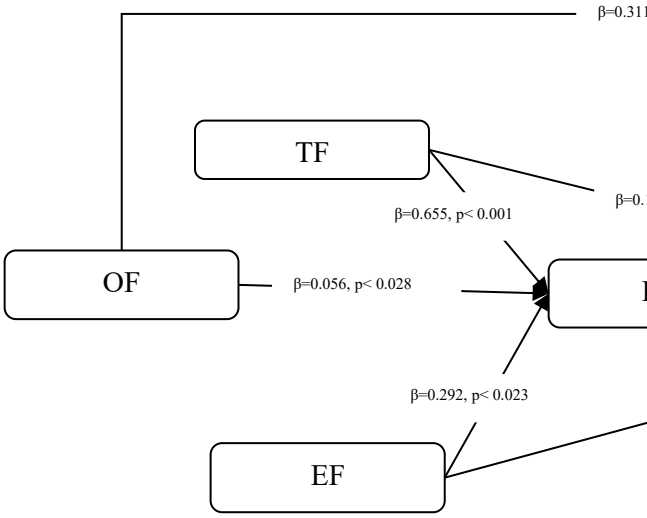
Latent Constructs	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DT	0.941	0.942	0.962	0.894
EF	0.846	0.871	0.885	0.564
KM	0.880	0.885	0.905	0.517
OF	0.896	0.906	0.916	0.580
TF	0.897	0.907	0.921	0.661

Source: Author's own

4.1.2 Structural Model Analysis

The structural model (fig-2) illustrates a causal relationship among the constructs (Hair et al., 2018). This method is grounded on mediation analysis, followed by the interpretation of subsequent hypotheses. The mediation analysis used the bootstrapping method, generating the necessary p-values for the investigation with a recommended 5,000 resamples (Hair et al., 2018). Additionally, this study calculated the coefficient of determination, the R^2 value, to check the explanatory power of independent variables on the dependent variables. For the dependent variable, digital transformation, the independent variables are technology, organization, and environment. The technology, organization, and environment explain 73.8% (R^2= 0.738) of the variance for variable knowledge management. Further, the combined effect of technology, organization, environment, and knowledge management explains 84.9% of the variance on digital transformation (R^2=0.849).

Fig-2: Path Analysis



The structural model was analyzed to test the hypothesized relationships among the constructs, focusing on the direct and indirect effects that influence digital transformation. Path analysis revealed significant relationships, particularly the mediating role of knowledge management. The technological factors demonstrated a strong positive influence on knowledge management (β=0.655, t=4.649, p < 0.001), hence supporting H1b and highlighting the importance of technological resources in fostering knowledge processes. However, the direct relationship between technological factors and digital technologies was not supported (β=0.113, t=0.734, p=0.33), not supporting H1a, suggesting that technological factors exert its influence on digital technologies primarily through knowledge management. Organizational factors showed significant direct effects on both knowledge management (β=0.056,

t=0.624, p=0.028) and digital technologies (β=0.311, t=3.917, p=0.005), hence supporting both H2a and H2b. This indicates that organizational readiness and support directly facilitate digital transformation efforts. Similarly, environmental factors significantly impacted knowledge management (β=0.292, t=1.996, p=0.023), supporting H3b, but its direct effect on digital technologies was not significant (β=0.16, t=1.208, p=0.16), supporting H3a.

H_{3b}	EF→KM	0.292	2.996	0.023	Supp
H_4	KM→DT	0.471	2.605	0.005	Supp
H_5	TF→KM→DT	0.308	5.332	0.01	Supp
H_6	OF→KM→DT	0.0263	1.332	0.65	Not S
H_7	EF→KM→DT	0.137	3.241	0.021	Supp

Source: Author's own

4.2 Mediation analysis

Mediation analysis was conducted using a bootstrapping approach with 5,000 resamples, as recommended by Hair et al. (2018), to obtain reliable estimates of indirect effects and their significance levels. The analytic approach follows the guidelines established by Zhao et al. (2010), whereby the presence and type of mediation are determined by examining both direct and indirect effects: partial mediation occurs when both paths are significant, while full mediation is present if only the indirect effect is significant.

Table 4 summarizes the mediation results. The indirect effect of environmental factors on digital transformation through knowledge management was significant (EF → KM → DT; β = 0.137, t = 3.241, p = 0.021), as was the indirect effect from technological factors (TF → KM → DT; β = 0.30, t = 5.332, p = 0.01), supporting hypotheses H7 and H5, respectively. These results indicate that knowledge management mediates the relationship between both technological and environmental factors and digital transformation, underscoring its role as a conduit through which external and technological resources drive organizational transformation (Alavi & Leidner, 2001).

In this study, the indirect effect of organizational factors on digital transformation via knowledge management was not significant (OF → KM → DT; β = 0.0263, t = 1.332, p = 0.65), indicating that H6 is not supported. This suggests that organizational factors can directly influence digital transformation outcomes, independent of knowledge management processes. Overall, the results provide robust empirical evidence for the centrality of knowledge management as a mediator between selected antecedents and digital transformation, while also affirming the independent impact of organizational factors within this process.

Table 4: Path Analysis and Hypothesis Results

ses	Paths	Estimates	t-Value	p-value	Decision
	TF→DT	0.113	0.734	0.33	Not Supported
	TF→KM	0.655	4.649	0.001	Supported
	OF→DT	0.311	3.917	0.005	Supported
	OF→KM	0.056	0.624	0.028	Supported
	EF→DT	0.16	1.208	0.16	Not Supported

Discussion

This empirical investigation elucidates the intricate interrelationships between technological, organizational, and environmental factors and their influence on digital transformation through knowledge management processes. The findings reveal significant positive effects of all three factors on knowledge management capabilities, corroborating previous scholarly work (Soto-Acosta et al., 2014). Furthermore, the analysis confirms that organizational factors directly impact digital transformation initiatives, while technological and environmental factors operate through more nuanced intermediary pathways. Executive leadership emerges as a critical determinant in knowledge management ecosystems. Singh et al. (2021) established that top management's valuation of knowledge and their strategic approaches to knowledge generation directly shape open innovation initiatives, consequently enhancing organizational performance. This underscores the instrumental role of executive leadership in cultivating environments conducive to effective knowledge management and innovation. Organizational culture similarly constitutes a fundamental infrastructure for knowledge-sharing behaviors, significantly influencing knowledge management practices (Zheng et al., 2010).

External pressures distinctly shape knowledge management implementation within organizations. Wang and Wang (2016) demonstrated that competitive forces substantially influence knowledge management adoption in IT organizations. Regulatory frameworks, particularly data privacy regulations and industry standards, significantly affect organizational approaches to knowledge acquisition, retention, and dissemination (Azeem et al., 2021). Through strategic deployment of technology, cultivation of collaborative knowledge cultures, and responsive adaptation to external drivers, organizations optimize knowledge management processes that enhance technological resource utilization and adaptive capabilities. The research illuminates significant positive relationships between organizational factors and digital transformation outcomes, necessitating alignment between technological capabilities and organizational structures to navigate digital transformation effectively (Hanelt et al., 2021; Wessel et al., 2021). Interestingly, the direct relationship between technological factors and environmental factors and digital transformation lacks empirical support, emphasizing instead the mediating role of internal knowledge processes in organizational adaptation.

Knowledge management functions as a critical mediator between technological factors, environmental factors, and digital transformation. This mediation effect indicates that technological advancements and environmental conditions influence digital transformation primarily through structured knowledge management processes. By recognizing knowledge management as a mediator, IT organizations can strategically leverage knowledge assets to navigate complexities, stimulate innovation, and drive successful digital transformation initiatives (Bhatt, 2001). Notably, knowledge management does not mediate the relationship between organizational factors and digital transformation, suggesting organizational elements exert more direct influence on transformation processes. When knowledge-sharing practices lack integration into organizational digital strategy, their mediating impact diminishes substantially (Chatterjee et al., 2021). While this investigation emphasizes explicit knowledge processes, tacit knowledge embedded in experiential learning and informal expertise plays an equally fundamental role in organizational decision-making and innovation. Organizations effectively capturing and integrating tacit knowledge enhance their adaptability to technological and market fluctuations (Foos et al., 2006; Tamer Cavusgil et al., 2003). To maximize knowledge management potential in digital transformation, firms should implement comprehensive strategies facilitating both explicit and tacit knowledge transfer through mentorship programs, communities of practice, and AI-driven knowledge-sharing platforms (Andreeva & Kianto, 2011).

5.1 Theoretical Contributions

This study constitutes one of the first systematic investigations exploring the collective relationship between technological, organizational, and environmental factors and digital transformation, incorporating knowledge management as a mediating construct within the IT sector context. The findings definitively establish knowledge management as a critical factor for successful digital transformation initiatives. This research contributes significantly to digital transformation literature by offering a more dynamic, integrated perspective. The identification of full and partial mediation effects of knowledge management demonstrates that organizations possess a viable approach to digital transformation through the deliberate promotion of knowledge management processes.

Moreover, this investigation substantially contributes to the refinement and validation of Knowledge-Based View (KBV) theory within digital transformation contexts. While KBV theory has been extensively applied in strategic management research to elucidate how organizational knowledge contributes to competitive advantage, its applicability within digital transformation processes remained underexplored. By applying KBV theory to analyze relationships between technological, organizational, and environmental factors and digital transformation, this study provides compelling empirical evidence supporting KBV theoretical propositions in the digital age. This enhances both the credibility and robustness of KBV theory while establishing a theoretical framework applicable across diverse industries to understand knowledge's role in driving digital transformation.

5.2 Practical Implications

Beyond theoretical contributions, this research offers actionable insights for IT professionals across organizational hierarchies. Organizations must invest deliberately in fostering robust learning cultures connected to knowledge management and digital transformation initiatives. Regular, targeted training programs should be implemented to harness the staff's potential fully. To ensure effective knowledge management, professionals must meticulously implement processes for knowledge acquisition, sharing, development, and integration.

Executive leadership engagement emerges as crucial for successful digital transformation initiatives alongside robust knowledge management practices. Senior management must actively champion both initiatives, facilitating organizational knowledge acquisition and driving knowledge sharing efforts. With executive commitment, organizations can cultivate environments promoting continuous learning and seamless knowledge exchange among employees. However, knowledge management initiatives frequently encounter resistance, knowledge silos, and expertise-sharing reluctance. Organizations should develop comprehensive change management strategies emphasizing leadership engagement, transparent communication, and employee involvement, while incentivizing knowledge sharing through recognition programs and career advancement opportunities.

Knowledge management strategy effectiveness varies significantly across organizational contexts. IT startups thrive with agile approaches utilizing cloud-based platforms, real-time collaboration tools, and decentralized decision-making structures. Conversely, larger organizations benefit from structured knowledge management frameworks, standardized workflows, and cross-functional mechanisms that dismantle silos and enhance operational efficiency. By customizing knowledge management strategies to specific organizational environments, companies significantly enhance digital transformation outcomes. Crucially, successful knowledge management in digital transformation requires alignment between knowledge initiatives and measurable business outcomes. Effective knowledge management accelerates innovation cycles, enhances operational efficiency, and improves strategic decision-making, contributing to sustained competitive advantage. Organizations integrating knowledge management into digital transformation efforts can anticipate increased adaptability, enhanced productivity, and improved

alignment between technological advancements and strategic business objectives.

Conclusion and future research direction

This study provides a comprehensive examination of how technological, organizational, and environmental factors collectively influence digital transformation within IT organizations, foregrounding the pivotal mediating function of knowledge management. Drawing on robust data gathered from 410 IT professionals in the Indian IT sector, the analysis demonstrates that while organizational factors directly impact digital transformation outcomes, the effects of technological and environmental forces are most influential when channeled through effective knowledge management processes. This nuanced insight underscores the complexity of digital transformation: successful outcomes are rarely the product of isolated factors, but instead emerge from the alignment and integration of contextual elements, directly and via the structured mobilization of organizational knowledge.

The findings position knowledge management not merely as a supporting activity, but as a dynamic organizational capability that enables the absorption, dissemination, and practical application of new technologies and external intelligence. Organizations that strategically invest in building and leveraging knowledge management systems are better equipped to navigate the challenges of technological change, respond proactively to shifts in regulatory and competitive landscapes, and sustain ongoing innovation. By embedding systematic knowledge acquisition, sharing, and utilization into digital transformation initiatives, organizations strengthen their resilience and adaptability, ensuring that transformation is both effective and enduring across volatile environments.

Limitations and Future Research Scope

This research is not without its boundaries. The study's concentrated focus on the Indian IT sector offers deep contextual relevance but may limit the generalizability of the insights to other industries or geographic settings with different knowledge dynamics and digital maturity levels. Endogeneity and reverse causality between knowledge management and digital transformation were considered. Bootstrapped joint modeling and instrument-free approaches were applied(Qian & Xie, 2024). We suggest longitudinal or experimental studies for better causal inference. Multiple procedural (anonymity, psychological separation)(Podsakoff et al., 2012) and statistical remedies for common method bias were implemented, including Harman's single-factor test and VIF approach (Kock, 2015). Future research should broaden the scope to encompass varying sectors and international environments, employ longitudinal designs, and integrate qualitative approaches to enrich the exploration of knowledge management's mediating effects. Ultimately, this study affirms that knowledge management is central to translating digital ambition into tangible, sustainable change, making it indispensable for any IT organization aspiring to thrive amidst digital disruption..

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