

AMPLIFYING THE DIGITAL SUPPLY CHAIN MODEL: THE MODERATING ROLE OF BIG DATA ANALYTICS CAPABILITY ON PERCEPTIONS OF PERSONNEL IN THE MANUFACTURING INDUSTRY

AMPLIANDO O MODELO DA CADEIA DE SUPRIMENTOS DIGITAL: O PAPEL MODERADOR DA CAPACIDADE DE ANÁLISE DE BIG DATA NAS PERCEPÇÕES DOS FUNCIONÁRIOS DA INDÚSTRIA DE MANUFATURA

Article received on: 8/29/2025

Article accepted on: 11/28/2025

Yuanyuan Xing*

*Faculty of Management Sciences, Dhonburi Rajabhat University, Bangkok, Thailand
tracyxing113@163.com

Tachakorn Wongkumchai*

*Faculty of Management Sciences, Dhonburi Rajabhat University, Bangkok, Thailand
tachakorn.w@dru.ac.th

The authors declare that there is no conflict of interest

Abstract

This study investigates how Big Data Analytics Capability (BDAC) shapes the interplay among Corporate Digital Transformation (CDT), Supply Chain Digital Transformation (SCDT), Customer Data Engagement (CDE), and Corporate Performance (CP) in Chinese manufacturing firms. Grounded in the Resource-Based View and Dynamic Capabilities Theory, BDAC is conceptualized as a higher-order, VRIN-aligned strategic capability enabling firms to sense, seize, and reconfigure resources in digitally transformed environments. Survey data from 368 employees and managers were analyzed using structural equation modeling, revealing that CDT and SCDT significantly enhance CP, CDE partially mediates the CDT–CP relationship, and BDAC positively moderates both the CDT–CDE and SCDT–CP links. These findings underscore that technology adoption alone is insufficient; developing analytical capabilities, fostering a data-driven culture, and integrating BDAC into core supply chain functions are critical for realizing digital transformation value. The study contributes theoretically by elucidating BDAC's role in bridging digital investments and perceived organizational outcomes, and practically by guiding managers to balance technological infrastructure with capability development. Limitations include its cross-sectional design and reliance on perception-based data, suggesting future longitudinal and cross-context research.

Keywords: Big Data Analytics Capability (BDAC). Perception-Based Analysis. Digital

Resumo

Este estudo investiga como a Capacidade de Análise de Big Data (CAD) molda a interação entre a Transformação Digital Corporativa (TDC), a Transformação Digital da Cadeia de Suprimentos (TDCS), o Engajamento de Dados do Cliente (EDC) e o Desempenho Corporativo (DC) em empresas manufatureiras chinesas. Fundamentada na Visão Baseada em Recursos e na Teoria das Capacidades Dinâmicas, a CAD é conceituada como uma capacidade estratégica de ordem superior, alinhada à VRIN, que permite às empresas perceber, aproveitar e reconfigurar recursos em ambientes digitalmente transformados. Dados de pesquisa de 368 funcionários e gerentes foram analisados usando modelagem de equações estruturais, revelando que a TDC e a TDCS aprimoram significativamente o DC, o EDC medeia parcialmente a relação TDC-DC e a CAD modera positivamente as relações TDC-EDC e TDCS-DC. Essas descobertas ressaltam que a adoção de tecnologia por si só é insuficiente; o desenvolvimento de capacidades analíticas, o fomento de uma cultura orientada a dados e a integração da CAD às funções principais da cadeia de suprimentos são cruciais para a obtenção de valor da transformação digital. O estudo contribui teoricamente ao elucidar o papel da Capacidade de Análise de Big Data (BDAC) na conexão entre investimentos digitais e resultados organizacionais percebidos, e praticamente ao orientar gestores no equilíbrio entre infraestrutura tecnológica e desenvolvimento de capacidades. As limitações incluem seu delineamento transversal e a dependência de dados baseados em percepção,



Supply Chain Model. Dynamic Capabilities Theory. Chinese Manufacturing Industry.

sugerindo a necessidade de pesquisas longitudinais e em diferentes contextos no futuro.

Palavras-chave: *Capacidade de Análise de Big Data (BDAC). Análise Baseada em Percepção. Modelo de Cadeia de Suprimentos Digital. Teoria das Capacidades Dinâmicas. Indústria Manufatureira Chinesa.*

1 INTRODUCTION

The accelerating pace of digital transformation is reshaping traditional manufacturing enterprises, intensifying global competition, and increasing demands for operational agility. Within supply chain management, advanced digital technologies—such as IoT, AI, and big data analytics—are widely recognized as strategic levers for enhancing efficiency, flexibility, and customer responsiveness. These technologies can enable real-time data visibility, predictive decision-making, and cross-functional integration. However, despite substantial investments, the translation of such digital initiatives into sustained corporate performance (CP) remains inconsistent across firms, suggesting that technology adoption alone is insufficient; the capability to analyze, interpret, and leverage data—both technically and culturally—has become a decisive factor in value creation. Situated within a broader doctoral dissertation that develops a comprehensive digital supply chain framework, this article isolates the mechanism most salient for theory testing and publication. Specifically, whereas the full dissertation evaluates an extended set of hypotheses (e.g., H1–H9), the present paper purposefully examines a theoretically central subset to provide a focused and rigorous test.

While prior studies have examined digital transformation (DT) and big data analytics capability (BDAC) independently, limited research investigates how BDAC moderates the relationship between corporate digital transformation (CDT), supply chain digital transformation (SCDT), and performance outcomes. Existing literature predominantly relies on objective indicators or case studies, overlooking employees' and managers' perceptions, which can shape transformation effectiveness through cognitive and cultural readiness. This study addresses this gap by adopting a perception-based approach, enabling a deeper understanding of the human-centered and capability-driven dimensions of digital transformation. Grounded in the Resource-Based View (RBV) and

Dynamic Capabilities Theory (DCT), BDAC is conceptualized as a VRIN-aligned strategic capability and a higher-order dynamic capability that enables firms to sense opportunities, seize them through data-driven decision-making, and reconfigure resources to sustain competitiveness. By delimiting the scope to the core mechanism in this article, we present a clean test of BDAC's moderating function, while the dissertation documents the broader network of interactions and extensions.

This study develops and empirically tests an integrated digital supply chain model incorporating CDT, SCDT, Customer Data Engagement (CDE), BDAC, and CP, using perception-based survey data from 368 employees and managers in four Chinese manufacturing enterprises. The findings demonstrate that CDT and SCDT positively influence CP, CDE partially mediates the CDT–CP relationship, and BDAC positively moderates the effects of CDT on CDE and SCDT on CP. The study contributes by (1) clarifying BDAC's moderating role in linking digital transformation to perceived performance outcomes, (2) extending RBV and DCT to explain how analytical capabilities bridge technology adoption and organizational results, and (3) offering practical guidance for managers to balance investments in digital infrastructure with capability-building, including targeted training, fostering a data-driven culture, and embedding BDAC into key supply chain functions. Consistent with the dissertation's broader research program, the present article reports results for the subset of hypotheses (H1–H4) that capture the mediating role of CDE and the moderating role of BDAC; the remaining hypotheses are developed and validated in the thesis through extended modeling and robustness checks.

2 LITERATURE REVIEW

Grounded in Dynamic Capabilities and Information Management, the review advances a perception-based mechanism of digital transformation. Big Data Analytics Capability (BDAC) is conceptualized as a VRIN-aligned, higher-order dynamic capability that helps firms' sense, seize, and reconfigure resources through data. In China's manufacturing context, policy and platform ecosystems heighten the need for such capabilities. Prior work seldom treats BDAC as a contextual moderator linking corporate (CDT) and supply-chain digital transformation (SCDT) to performance (CP). The paper therefore proposes four hypotheses: H1 CDE→CP (positive) ; H2 CDE

mediates CDT→CP; H3 BDAC positively moderates SCDT→CP; H4 BDAC positively moderates CDT→CDE. The framework positions CDE as the mediating mechanism and BDAC as the strategic moderator that together explain how DT converts into perceived performance gains.

2.1 Theoretical development

Dynamic capability theory (Teece, Pisano, & Shuen, 1997) explains how organizations integrate, build, and reconfigure resources to sustain competitive advantage in dynamic environments. Beyond operational competence, dynamic capabilities involve sensing change, seizing opportunities, and reconfiguring resources (Eisenhardt & Martin, 2000). At the individual level, they manifest in employees' and managers' adaptability to new technologies and market shifts, embedding learning and innovation into daily decision-making (Teece, 2017). In digital supply chains, such capabilities enable leveraging big data analytics, cloud computing, and AI to enhance responsiveness (Warner & Wäger, 2019). This study extends dynamic capability theory by conceptualizing Big Data Analytics Capability (BDAC) as a higher-order dynamic capability. BDAC enables organizations to process large-scale data, detect emerging patterns, make timely data-driven decisions, and reconfigure resources for sustained advantage. From the Resource-Based View (RBV), BDAC meets VRIN criteria—valuable, rare, inimitable, and non-substitutable—making it a strategic core asset in competitive markets.

Information management theory (Choo, 1996; Bendoly, 2009) addresses the systematic acquisition, processing, and dissemination of information to support decision-making and coordination. Individually, it requires identifying key information, using digital tools for evaluation, and sharing insights to reduce silos and improve agility (Kache & Seuring, 2017; Hajli et al., 2015). In digital transformation, it offers a framework to optimize information flows, collaboration, and operational efficiency (Dubey et al., 2019). From a perception-based view, digital transformation is not only technological change but also a process where individuals perceive—absorb—reconfigure information into actions. Dynamic capability emphasizes perception and adaptation, while information management stresses awareness and sharing. Together, they enable

employees to drive perceived supply chain (SCDT) and corporate digital transformation (CDT), enhancing corporate performance (CP) and customer data engagement (CDE).

In China's manufacturing context, these theoretical linkages gain heightened importance. National strategies such as Made in China 2025 and policy-driven industrial upgrading create strong institutional incentives for firms to cultivate dynamic capabilities and BDAC. The rapid expansion of digital infrastructure, combined with unique market characteristics such as large-scale e-commerce ecosystems, accelerates the integration of advanced information management practices into daily operations. Consequently, employees and managers in Chinese manufacturing enterprises operate in an environment where the ability to interpret policy signals, adapt swiftly to regulatory changes, and leverage big data for both operational efficiency and innovation is critical for sustaining competitive advantage.

However, existing research rarely examines BDAC as a moderating mechanism between CDT/SCDT and performance from a perception-based perspective, often treating it as a static or direct driver. This study addresses this gap by explicitly integrating BDAC as a higher-order dynamic capability and testing its moderating role in the relationship between perceived digital transformation and performance. Using perception-level data, it provides novel insights into how analytical capabilities shape the effectiveness of digital transformation in generating perceived organizational value.

In summary, dynamic capability theory and information management theory jointly explain how organizations and individuals adapt to digital transformation in supply chains: the former by enabling sensing, seizing, and reconfiguring of resources; the latter by ensuring effective information acquisition, processing, and sharing. While prior research recognizes BDAC's importance for performance, it has been predominantly examined as a direct driver rather than as a contextual factor. The moderating role of BDAC—especially from a perception-based perspective linking CDT and SCDT to CP—remains underexplored. To address this gap, the next section develops hypotheses grounded in these theoretical foundations, integrating BDAC's moderating role with the mediating effect of CDE in the digital transformation–performance relationship.

2.2 Hypothesis development

Grounded in value co-creation theory and a data-driven perspective, Customer Data Engagement (CDE) is not merely a unidirectional process of customers providing data to the organization; rather, it is a dynamic mechanism of bidirectional interaction and value co-creation between customers and the firm. Customers influence the optimization and iteration of products and services through feedback, co-creation suggestions, and various interactive behaviors, while firms leverage these data to generate actionable insights, improving resource allocation efficiency and responsiveness. At the perceptual level, higher CDE is often associated with employees' and managers' subjective evaluations of increased customer satisfaction, loyalty, and usage frequency (Erevelles et al., 2016). Therefore:

Hypothesis 1 (H1): Employees' and managers' perceived customer data engagement (CDE) has a direct and significant positive effect on corporate performance (CP).

Perceived Corporate Digital Transformation (CDT) expands digital touchpoints and interaction channels—such as online platforms, social media, and personalized interfaces—thereby enhancing customer visibility and interaction intensity while generating comprehensive customer data and insights. This enables frontline employees and middle managers to better understand customer needs and behavioral patterns, optimize the product–marketing–service mix, and ultimately deepen and broaden customer engagement. Consequently, CDE serves as a mediating mechanism in the perceptual pathway, translating the potential value of CDT into subjective assessments of improved corporate performance (Erevelles et al., 2016). Therefore:

Hypothesis 2 (H2): Employees' and managers' perceived customer data engagement (CDE) mediates the relationship between perceived corporate digital transformation (CDT) and corporate performance (CP).

Within this mechanism, Big Data Analytics Capability (BDAC) acts as a higher-order dynamic capability reflecting perceptions of an organization's maturity in data collection, integration, analysis, visualization, and predictive analytics. When BDAC is high, the pathway from perceived Supply Chain Digital Transformation (SCDT) to CP benefits from more effective conversion of supply chain data into actionable insights, including bottleneck identification, process optimization, and cross-functional

collaboration, thereby amplifying performance gains (Gupta & George, 2016; Mikalef et al., 2018). Therefore:

Hypothesis 3 (H3): Employees' and managers' perceived big data analytics capability (BDAC) positively moderates the relationship between perceived supply chain digital transformation (SCDT) and corporate performance (CP).

Similarly, in the CDT–CDE pathway, high BDAC enhances the timeliness and precision of customer data analytics, enabling targeted audience profiling, preference identification, and contextual marketing strategies. This fosters deeper customer participation and value co-creation, thereby strengthening CDT's positive impact on CDE (Gupta & George, 2016; Mikalef et al., 2018). Therefore:

Hypothesis 4 (H4): Employees' and managers' perceived big data analytics capability (BDAC) positively moderates the relationship between perceived corporate digital transformation (CDT) and customer data engagement (CDE).

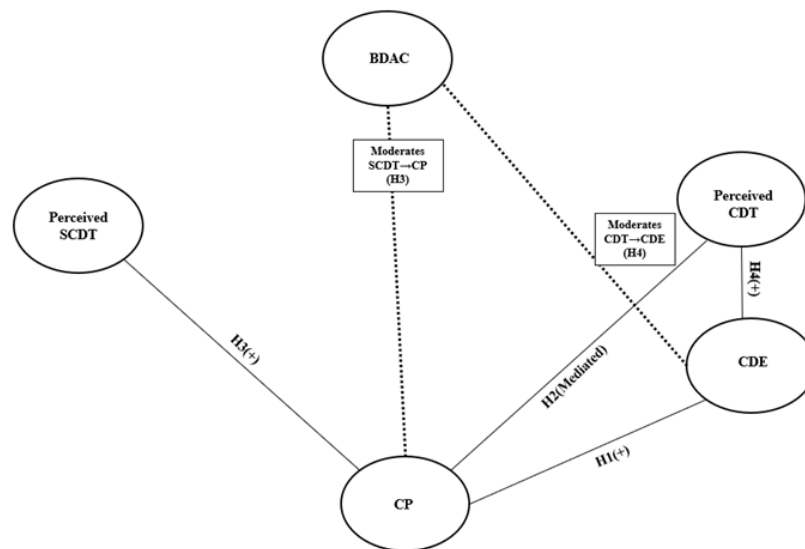
2.3 Conceptual framework

Figure 2.1 depicts the conceptual framework integrating perceived Supply Chain Digital Transformation (SCDT), perceived Corporate Digital Transformation (CDT), Customer Data Engagement (CDE), Big Data Analytics Capability (BDAC), and Corporate Performance (CP) from the perspectives of employees and managers. Grounded in value co-creation theory, dynamic capability theory, and the resource-based view, the framework highlights that digital transformation outcomes are shaped by both technological initiatives and organizational capabilities.

CDE is posited to directly enhance CP (H1) by increasing customer satisfaction, loyalty, and usage. It is also proposed to mediate the CDT–CP relationship (H2), as digital transformation expands customer touchpoints, generates richer data, and fosters deeper engagement. BDAC is introduced as a boundary condition. In the SCDT–CP link, high BDAC enables more effective use of supply chain data for bottleneck identification, process optimization, and cross-functional coordination, thereby amplifying performance gains (H3). In the CDT–CDE link, BDAC facilitates faster and more precise customer analytics, supporting targeted engagement strategies and value co-creation, thus strengthening CDT's effect on CDE (H4).

Overall, the framework positions CDE as a critical mediating mechanism and BDAC as a strategic moderator, together explaining how digital transformation in both corporate and supply chain domains can enhance perceived corporate performance in manufacturing contexts.

Figure 1 - Conceptual Framework with BDAC Moderating Effects



Source: Authors

3 METHODOLOGY

This article is derived from the author's doctoral dissertation, which evaluates a comprehensive hypothesis set (H1–H9). For clarity and analytical focus, the 8esponde paper restricts empirical tests to a theoretically central subset (H1–H4), employing perception-based survey data and SEM with hierarchical regressions; analyses for the remaining hypotheses are reported in the dissertation.

A structured questionnaire survey was administered to a diverse sample of 368 respondents from four manufacturing enterprises differing in ownership structures and sub-industrial classifications. Structural equation modeling (SEM), mediation analysis, and moderation analysis were employed to examine the hypothesized relationships and test the proposed conceptual framework. The findings extend the discourse on digital transformation by demonstrating that the perceived capability to transform data into actionable insights is pivotal for realizing the strategic and performance outcomes of digital initiatives. In doing so, the study advances RBV by evidencing how a data-centric

capability can serve as a strategic resource, while enriching DCT by revealing the concrete moderating mechanisms through which higher-order capabilities such as BDAC facilitate resource orchestration in digitally transforming supply chains. To mitigate potential common method bias (CMB), the survey design incorporated procedural remedies including randomized question order, varied scale anchors, and assurances of respondent anonymity, in addition to a post-hoc Harman's single-factor test.

3.1 Sample selection and data sources

This manuscript adopts a quantitative research design, drawing exclusively on structured survey data to generate empirical findings. While the broader research 9resent from which these data are drawn may encompass additional methodological 9resente9es, the 9resente study focuses solely on the quantitative dimension, thereby ensuring analytical purity and methodological consistency.

To explore the perspectives of employees and managers in traditional Chinese manufacturing enterprises, the study defines the population as all individuals engaged in manufacturing-related roles. The sample consists of 368 respondents.

To ensure diversity and generalizability of the findings, participants were drawn from four manufacturing companies differing in industrial sectors and types of ownership. These companies were not selected as individual case studies but served as sources for participant recruitment. The sample covers both state-owned and private enterprises, as well as companies from various manufacturing sub-sectors such as heavy industry, food processing, and daily chemical products. This approach supports broad representativeness of perspectives within the industry, thereby enhancing the external validity of the results.

3.2 Variable measurement

According to the conceptual framework shown in Figure 1, this study includes four types of variables: the dependent variable, the independent variable, the moderating variable, and the mediating variable.

Firstly, Corporate Performance (CP) in this study is the dependent variable. It refers to employees' and managers' overall perceptions of the enterprise's profitability, market share, operational efficiency, customer satisfaction, and overall competitiveness.

This variable reflects the ultimate manifestation of digital transformation and related factors in the organization's business outcomes. Since this study is based on perceptual data from individuals, CP represents subjective evaluations of organizational performance rather than objective financial indicators.

Secondly, Customer Data Engagement (CDE), Perceived Corporate Digital Transformation (CDT), and Perceived Supply Chain Digital Transformation (SCDT) are the independent variables in this study. Among them, Customer Data Engagement (CDE) measures the extent to which customers actively interact with the enterprise, particularly in activities such as data sharing, providing feedback, participating in surveys, and co-developing new products. A high level of CDE not only strengthens the relationship between customers and the enterprise but also provides valuable data resources that can improve decision-making and enhance performance. Perceived Corporate Digital Transformation (CDT) refers to employees' and managers' subjective perceptions of the enterprise's digitalization in areas such as organizational structure, business processes, products and services, and management systems (Erevelles et al., 2016). CDT reflects the impact of digital transformation at the organizational level on operations and strategy. Perceived Supply Chain Digital Transformation (SCDT) refers to employees' and managers' subjective perceptions of the application of digital technologies—such as cloud computing, the Internet of Things, and artificial intelligence—in supply chain operations. This includes improvements such as information-sharing platforms, real-time data tracking, and intelligent inventory management.

Thirdly, Big Data Analytics Capability (BDAC) in this study serves as the moderating variable. It refers to the ability to collect, integrate, process, and analyze massive amounts of data and transform them into insights that support operational and strategic decision-making. In this research, BDAC is considered to enhance (1) the positive effect of Perceived Supply Chain Digital Transformation (SCDT) on Corporate Performance (CP), and (2) the positive effect of Perceived Corporate Digital Transformation (CDT) on Customer Data Engagement (CDE).

Finally, in this study, CDE is not only an independent variable but also functions as a mediating variable, linking the relationship between Perceived Corporate Digital Transformation (CDT) and Corporate Performance (CP). Through customer data engagement, digital transformation can better meet customer needs and drive performance improvement (Erevelles et al., 2016). More details are presented in Table 1.

Table 1 - Variable Summary Table

Variable Type	Variable Name	Definition
Dependent Variable	Corporate Performance (CP)	Subjective perception of profitability, market share, operational efficiency, customer satisfaction, and competitiveness.
	Customer Data Engagement (CDE)	Degree of customer engagement in data sharing, feedback, surveys, and co-development.
Independent Variables	Perceived Corporate Digital Transformation (CDT)	Perception of digitalization in enterprise structure, processes, products, and systems.
	Perceived Supply Chain Digital Transformation (SCDT)	Perception of digital technology application in supply chain operations.
Moderating Variable	Big Data Analytics Capability (BDAC)	Ability to collect, process, and analyze data to generate insights.
Mediating Variable	Customer Data Engagement (CDE)	Mediates the CDT–CP relationship by enhancing performance through engagement.

Source: Authors

3.3 Data analysis methods

All analyses in this manuscript are based exclusively on the quantitative survey dataset described above, with no qualitative components included in the reported findings. This ensures that the empirical evidence presented reflects a purely quantitative methodological approach.

Based on perceptual data collected from employees and managers in traditional Chinese manufacturing enterprises, this study employed a series of statistical techniques to ensure analytical rigor and validity. Initially, descriptive statistics were calculated for the five core variables—Perceived Supply Chain Digital Transformation (SCDT), Perceived Corporate Digital Transformation (CDT), Corporate Performance (CP), Customer Data Engagement (CDE), and Big Data Analytics Capability (BDAC)—including means, standard deviations, skewness, and kurtosis. This step provided an overview of respondents’ perceptions and enabled an assessment of data distribution characteristics (Gupta & George, 2016; Mikalef et al., 2018). The reliability of all measurement constructs was then examined using Cronbach’s Alpha (α) and Corrected Item-Total Correlation (CITC) values. All α coefficients exceeded 0.80 and CITC values were above 0.50, with no item deletion improving scale reliability, indicating strong internal consistency. Construct validity was subsequently assessed using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett’s test of sphericity. The KMO value of 0.887 confirmed sampling adequacy, while Bartlett’s test ($\chi^2 = 7850.122, p < 0.001$) indicated

significant correlations among variables, supporting the suitability of the data for factor analysis.

Structural Equation Modeling (SEM) was employed to test the hypothesized relationships, evaluating standardized path coefficients, standard errors, critical ratios, and p-values. Hypothesis H1 examined the direct perceived effect of CDE on CP, while H2 tested the mediating role of CDE in the relationship between CDT and CP, with mediation confirmed by the statistical significance of the indirect effect and the exclusion of zero from its confidence interval. To examine moderation effects (H3 and H4), hierarchical regression analyses were conducted in three steps: (1) entering the independent variable (SCDT or CDT) to estimate its direct effect; (2) adding BDAC as an additional independent variable to assess its direct contribution; and (3) introducing an interaction term (SCDT \times BDAC or CDT \times BDAC) to test for moderation. Changes in R^2 and F-statistics were used to determine the incremental explanatory power of the interaction. In both moderation models, the interaction terms were statistically significant, supporting H3—that BDAC positively moderates the perceived relationship between SCDT and CP—and H4—that BDAC positively moderates the perceived relationship between CDT and CDE (Hair et al., 2019).

4 DATA ANALYSIS AND RESULTS

This section outlines the analytical procedure. We begin with data screening and descriptive statistics, followed by reliability and validity assessments (e.g., Cronbach's α , composite reliability [CR], average variance extracted [AVE], and the Fornell–Larcker criterion). Common method bias is evaluated using Harman's single-factor test and a one-factor CFA. Using perception-based survey data from 368 employees and managers across four Chinese manufacturing firms, we then test direct and mediating relationships via SEM (maximum likelihood with bootstrapped indirect effects; H1–H2) and examine moderating effects via hierarchical regression with mean-centering and interaction terms (H3–H4). Model fit is reported using CMIN/DF, IFI, TLI, CFI, and RMSEA, and path estimates are presented as standardized coefficients (β) with significance levels. For interpretability, Figure 1 visualizes the statistically significant paths and their standardized coefficients.

4.1 Descriptive statistic

Table 2 reports the descriptive statistics for the five core variables of this study, namely perceived supply chain digital transformation (SCDT), perceived corporate digital transformation (CDT), corporate performance (CP), customer data engagement (CDE), and big data analytics capability (BDAC).

In terms of mean values, BDAC recorded the highest mean score (3.409), indicating that respondents generally perceive their organizations as possessing strong capabilities in data acquisition, integration, and analytics. The mean scores for perceived SCDT (3.036), CP (3.009), and CDE (3.004) are relatively close, all falling within the medium range, suggesting a consistent perception among respondents regarding supply chain digital transformation, corporate performance, and customer data engagement. Perceived CDT yielded the lowest mean score (2.937), reflecting a slightly lower perceived level of digital transformation at the corporate level compared with other variables.

Regarding dispersion, the standard deviation for perceived CDT is the largest (0.823), indicating greater variability in respondents' perceptions of corporate digital transformation. In contrast, perceived SCDT exhibits the smallest standard deviation (0.719), suggesting a more homogeneous perception of supply chain digital transformation.

The skewness statistics indicate that the absolute values for all variables are less than 1, implying that the distributions are approximately symmetric. BDAC shows a skewness of -0.378, indicating a slight left skew, whereas the skewness values for the other variables are close to zero, implying minimal asymmetry.

As for kurtosis, all variables present negative values, indicating flatter distributions compared to a normal distribution. CP has the lowest kurtosis (-0.819), suggesting a relatively greater dispersion in respondents' perceptions of corporate performance.

Overall, the findings reveal that respondents' mean perceptions of the five variables are generally at a moderate-to-high level and exhibit near-symmetrical distributions, although notable variability exists in perceptions of corporate digital transformation (CDT) and corporate performance (CP) (see Table 2).

Table 2 - Variable Summary Table

	No.	Min	Max	Aver	Standard Deviation	Skewness	Kurtosis		
	Statistics				Statistic	Standard	Statistic	Standard	
					s	Error	s	Error	
Perceived SCDT	36	1.28	4.71	3.03	0.719	0.127	-0.559	0.254	
	8	6	4	6					
Perceived CDT	36	1.16	4.83	2.93	0.823	0.127	-0.614	0.254	
	8	7	3	7					
CP	36	1.16	4.66	3.00	0.787	0.127	-0.819	0.254	
	8	7	7	9					
CDE	36	1.00	4.80	3.00	0.765	0.127	-0.355	0.254	
	8	0	0	4					
BDAC	36	1.20	5.00	3.40	0.790	0.127	-0.325	0.254	
	8	0	0	9					

Source: Authors

4.2 Reliability Testing

This study conducted a reliability analysis based on questionnaire responses from employees and managers, aiming to assess the stability and consistency of the scales across different individuals, times, and contexts. In management research, internal consistency reliability is one of the most used evaluation methods. This study employed Cronbach’s Alpha coefficient (α) to examine the internal consistency of each construct. The calculation formula is:

$$\alpha = \frac{n}{n - 1} \left(1 - \frac{\sum_{i=1}^n S_i^2}{S_x^2} \right) \tag{1}$$

Where

α is internal consistency reliability (Cronbach’s Alpha), n is number of items in the scale, S_i^2 is variance of the scores for the i -th item across all respondents, S_x^2 is variance of the total scores across all respondents.

The value of Cronbach’s Alpha ranges from 0 to 1, with higher values indicating stronger internal consistency of the scale. According to widely accepted academic standards, $\alpha \geq 0.9$ indicates excellent reliability, $0.7 \leq \alpha < 0.9$ indicates good reliability, $0.6 \leq \alpha < 0.7$ indicates acceptable reliability, $0.5 \leq \alpha < 0.6$ indicates relatively low reliability, and $\alpha < 0.5$ suggests insufficient reliability. In addition to the α coefficient, this study also

used the Corrected Item-Total Correlation (CITC) to examine each item. When an item's CITC value is below 0.4 and removing it would significantly increase the α coefficient, that item would be considered for deletion.

The analysis results show that the Cronbach's Alpha coefficients for all variables in this study are greater than 0.8, all CITC values exceed 0.5, and deleting any item would not improve the α coefficient of the scale. This indicates that all scales possess good internal consistency and reliability and are suitable for subsequent analysis (see Table 3).

Table 3 – Reliability Analysis

Variable	Name	Corrected Item- Total Correlation (CITC)	deleted α coefficient	Cronbach α coefficient
Perceived SCDT	SCDT1	0.839	0.827	0.873
	SCDT2	0.595	0.862	
	SCDT3	0.616	0.859	
	SCDT4	0.614	0.860	
	SCDT5	0.638	0.857	
	SCDT6	0.661	0.854	
	SCDT7	0.596	0.862	
Perceived CDT	CDT1	0.874	0.835	0.887
	CDT2	0.671	0.872	
	CDT3	0.628	0.878	
	CDT4	0.680	0.870	
	CDT5	0.658	0.874	
	CDT6	0.694	0.868	
CP	CP1	0.830	0.833	0.880
	CP2	0.653	0.865	
	CP3	0.641	0.867	
	CP4	0.671	0.862	
	CP5	0.646	0.866	
	CP6	0.687	0.860	
CDE	CDE1	0.805	0.779	0.851
	CDE2	0.621	0.831	
	CDE3	0.635	0.827	
	CDE4	0.611	0.833	
	CDE5	0.640	0.826	
BDAC	BDAC1	0.773	0.776	0.843
	BDAC2	0.643	0.813	
	BDAC3	0.596	0.825	
	BDAC4	0.624	0.818	
	BDAC5	0.611	0.822	

Source: Authors

4.3 Validity Testing

Following the reliability test, this study further conducted validity analysis to verify the effectiveness of the scales in measuring the research constructs. The validity analysis here primarily involved preliminary tests of construct validity, namely the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity.

The KMO test assesses the degree to which the sample data are suitable for factor analysis, with values ranging from 0 to 1. A value closer to 1 indicates stronger correlations among variables and greater suitability for factor analysis. Generally, a KMO ≥ 0.7 is considered adequate for factor analysis. Bartlett's test of sphericity tests the null hypothesis that the correlation matrix is an identity matrix (i.e., variables are uncorrelated). If $p < 0.05$, the null hypothesis is rejected, indicating that the data are appropriate for factor analysis.

Based on the perception data of employees and managers, the KMO value in this study is 0.887 (>0.7), indicating strong partial correlations among variables. Bartlett's test of sphericity yielded an approximate Chi-square value of 7850.122 with 820 degrees of freedom, and a significance level of $p = 0.000$, significantly rejecting the null hypothesis. This result confirms that the scale data in this study are suitable for subsequent factor analysis (see Table 4).

Table 4 -The results of the KMO value and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy		0.887
	Approximate Chi-Square	7850.122
Bartlett's Test of Sphericity	df	820
	Sig.	0.000

Source: Authors

4.3.1 Convergent Validity

Convergent validity was assessed using Average Variance Extracted (AVE) and Composite Reliability (CR) based on employees' and managers' perceptions. The results show that all constructs satisfy established criteria, with AVE values ranging from 0.504 to 0.576, exceeding the recommended minimum of 0.50, and CR values between 0.846 and 0.875, well above the 0.70 threshold. These findings indicate that each perceived construct explains a substantial proportion of variance in its measurement items and

demonstrates strong internal consistency. Collectively, the results confirm the robustness of the measurement model from the respondents’ perspective, supporting its suitability for subsequent structural equation modeling and hypothesis testing (see Table 5).

Table 5 – The table of AVE and CR

Variables	AVE	CR
Perceived SCDT	0.504	0.875
Perceived CDT	0.576	0.889
CP	0.555	0.881
CDE	0.541	0.853
BDAC	0.526	0.846

Source: Authors

4.3.2 Discriminant validity

The discriminant validity of the measurement model, based on employees’ and managers’ perceptions, was assessed by comparing the square root of the Average Variance Extracted (AVE) for each latent construct with its Pearson correlations with all other constructs. In every case, the square root of the AVE exceeded the highest perceived inter-construct correlation, confirming robust discriminant validity from a perceptual perspective. This result indicates that each construct is both conceptually and statistically distinct in respondents’ perceptions, reducing concerns about perceptual overlap or multicollinearity. Detailed results are presented in Table 6.

Table 6 - The table of Pearson Correlations and Square Roots of AVE

Variables	1	2	3	4	5	6	7
Perceived SCDT	0.710						
Perceived CDT	0.320**	0.265**	0.759				
CP	0.291**	0.294**	0.297**	0.745			
CDE	0.213**	0.345**	0.249**	0.234**	0.212**	0.736	
BDAC	-0.070	-0.008	-0.385**	0.043	0.084	-0.047	0.725

Source: Authors

4.3.3 Common method bias

To examine the potential impact of common method bias (CMB) arising from the use of a single survey instrument, Harman’s single-factor test was performed. All measurement items were subjected to an unrotated exploratory factor analysis. The

unrotated factor solution shows that the first factor accounts for 33.648% of the total variance, which is well below the commonly accepted threshold of 50%. This indicates that no single factor dominates the variance, suggesting that common method bias is unlikely to be a major concern in this study. The rotated solution further confirms that the variance is distributed across multiple factors, providing additional evidence that CMB does not pose a serious threat to the validity of the results. The results of the Total Variance Explained are presented in Table 7.

Table 7 - The Total Variance Explained (Unrotated Principal Component Analysis)

No	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.459	33.648	33.648	13.459	33.648	33.648	5.114	12.785	12.785
2	4.469	11.172	44.821	4.469	11.172	44.821	4.467	11.168	23.953
3	1.555	3.887	48.707	1.555	3.887	48.707	3.403	8.508	32.461
4	1.295	3.237	51.945	1.295	3.237	51.945	3.313	8.283	40.744
5	1.167	2.918	54.863	1.167	2.918	54.863	2.675	6.687	47.431
6	1.122	2.805	57.668	1.122	2.805	57.668	2.676	6.676	54.007
7	1.070	2.675	60.342	1.070	2.675	60.342	2.534	6.335	60.342

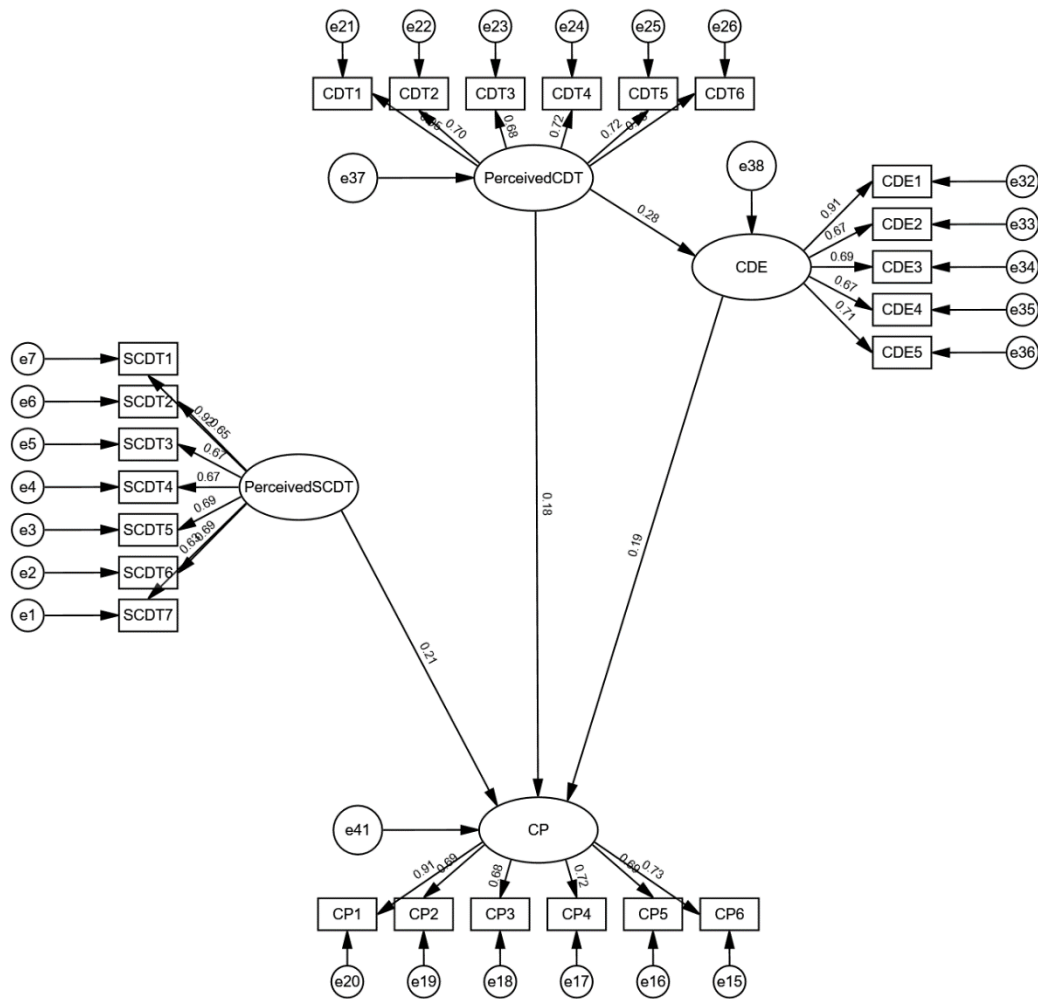
Source: Authors

4.4 SEM model diagram

The Structural Equation Modelling (SEM) diagram above illustrates the hypothesized causal relationships among constructions, as perceived by employees and managers. Each arrow represents a directional path from a perceived influencing construct to a perceived outcome construct. The model incorporates both direct and indirect paths, indicating potential mediation effects among perceived variables. For instance, the path from Perceived Corporate Digital Transformation (CDT) to Corporate Performance (CP) may be partially mediated through Customer Data Engagement (CDE), while Perceived Supply Chain Digital Transformation (SCDT) also exerts a direct positive influence on CP. It is important to note that these relationships do not depict objective organizational causality; rather, they represent perceived influences and

perceived outcomes, as reported by employees and managers in the survey data. It should be noted that the model depicts only direct and mediating paths, without testing moderating effects or other types of relationships.

Figure 2 - The model diagram of Structural Equation Modeling

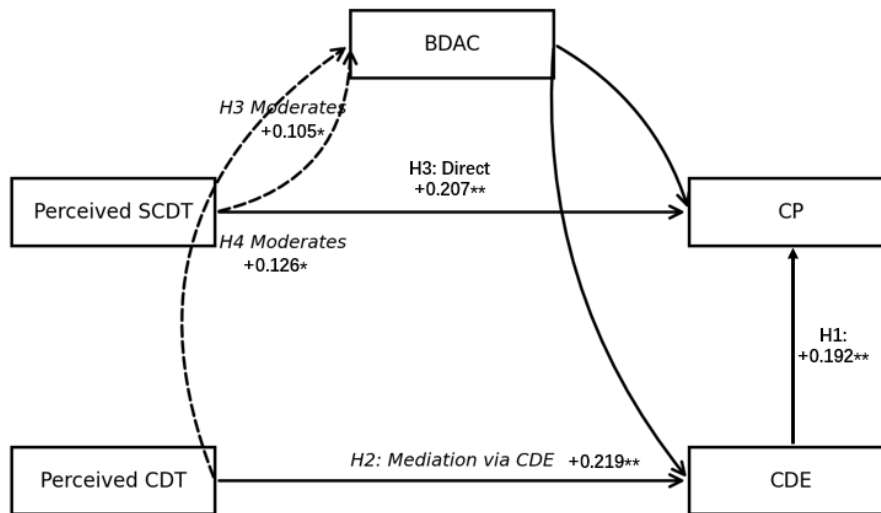


Source: Authors

In addition, Figure 2 illustrates the hypothesized structural relationships among the key constructs, with particular emphasis on the moderating role of Big Data Analytics Capability (BDAC). The model depicts two direct paths: from Perceived Corporate Digital Transformation (CDT) to Customer Data Engagement (CDE), and from Perceived Supply Chain Digital Transformation (SCDT) to Corporate Performance (CP). BDAC functions as a moderator on both pathways: (1) it strengthens the positive relationship

between SCDT and CP, and (2) it enhances the impact of CDT on CDE. Dashed arrows indicate the moderating paths from BDAC to each focal relationship, while solid arrows represent the hypothesized direct effects. This configuration highlights that higher levels of BDAC can amplify the performance and engagement benefits perceived to result from digital transformation initiatives.

Figure 3 - The moderating Role of BDAC



Source: Authors

4.4.1 Path analysis

From the perspectives of employees and managers, the Structural Equation Modeling (SEM) diagram (Figure 3) illustrates the hypothesized causal relationships among the constructs, encompassing both direct and indirect paths to capture potential mediation effects. Furthermore, the results of the path analysis (Table 8) indicate that all hypothesized relationships are statistically significant, further highlighting the validity of the proposed theoretical framework. The standardized path coefficients (standard estimates), standard errors (S.E.), critical ratios (C.R.), and corresponding p-values collectively verify the strength and reliability of the perceived causal effects examined in this study. These findings not only support the conceptual model but also demonstrate that the perceived relationships reported by employees and managers exhibit consistency and robustness across all tested paths.

Table 8 - The table of Path Analysis

Path	Standard Estimate	S.E.	C.R.	P
CDE → CP	0.192	0.045	3.281	0.001
Perceived SCDT → CP	0.207	0.071	3.640	***
Perceived CDT → CP	0.176	0.038	3.092	0.002
Perceived CDT → CDE → CP	0.277	0.048	4.977	***

Source: Authors

4.4.2 Model Fit Indices

According to Table 9, the CMIN/DF value of 1.348 is well below the threshold of 3, indicating a strong overall model fit. The RMSEA value of 0.031 is lower than the recommended maximum of 0.05, suggesting excellent goodness-of-fit. Additionally, the IFI, TLI, and CFI values—0.980, 0.977, and 0.979 respectively—all exceed the commonly accepted benchmark of 0.90, demonstrating that the model performs exceptionally well in comparative fit indices and that the structural configuration aligns closely with the observed data. All fit indices meet or exceed recommended thresholds, indicating excellent model fit.

Table 9 -The table of Model Fit Indices

Common Fit Indices	CMIN/DF	IFI	TLI	CFI	RMSEA
Criteria	<3	>0.9	>0.9	>0.9	<0.08
Values	1.348	0.980	0.977	0.979	0.031

Source: Authors

4.5 Hypothesis testing

Hypothesis 1 proposed that employees’ and managers’ perceived customer data engagement (CDE) has a direct and significant positive effect on perceived corporate performance (CP). The path coefficient (Standard Estimate = 0.129, S.E. = 0.044, C.R. = 2.291, p = 0.022) is positive and statistically significant at the 5% level, supporting H1. This indicates that active customer participation in data sharing, feedback, and co-innovation is perceived by employees and managers as enhancing overall organizational performance.

Hypothesis 2 stated that perceived customer data engagement mediates the relationship between perceived corporate digital transformation (CDT) and perceived corporate performance (CP). The indirect effect of CDT on CP via CDE is significant

(Standard Estimate = 0.036, S.E. = 0.004, C.R. = 0.075, $p = 0.034$), with the confidence interval excluding zero. This supports H2, indicating that part of the perceived positive influence of corporate digital transformation on performance operates through the enhancement of customer data engagement.

Additionally, to test Hypothesis 3, this study employed a hierarchical regression analysis based on perception data (Hayes, 2018). The results show that in Model 1, when SCDT was entered as the sole independent variable, its unstandardized coefficient ($b = 0.319, p < 0.01$) and standardized coefficient ($\beta = 0.291$) were both significant, explaining 8.5% of the variance in perceived corporate performance ($R^2 = 0.085$, adjusted $R^2 = 0.082$, $F = 33.951, p < 0.01$), indicating a significant positive perceived effect of SCDT on CP. In Model 2, the inclusion of BDAC as an additional independent variable led to a slight increase in the perceived explained variance ($R^2 = 0.089$, adjusted $R^2 = 0.084$), but its direct perceived effect was not statistically significant ($b = 0.063, \beta = 0.064, p > 0.05$), and the improvement in model fit was minimal. In Model 3, the introduction of the interaction term between SCDT and BDAC produced a statistically significant effect ($b = 0.151, p < 0.05; \beta = 0.105$), increasing the perceived explained variance to 10% ($R^2 = 0.100$, adjusted $R^2 = 0.092$) and significantly improving model fit ($\Delta R^2 = 0.011, \Delta F = 4.410, p < 0.05$). These results indicate that BDAC positively moderates the perceived relationship between SCDT and CP, meaning that when BDAC is high, organizational members generally perceive the performance-enhancing effect of SCDT to be more pronounced, thereby supporting Hypothesis H3. Please refer to Table 4.9 for the specific values.

Table 10 - The table of the Moderation Effect Analysis Results

Dependent Variable	Independent Variables	Model 1			Model 2			Model 3		
		<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
CP	Constant	3.009**	0.039	-	3.009**	0.039	-	3.015**	0.039	-
	Perceived SCDT	0.319**	0.055	0.291	0.324**	0.055	0.29	0.322**	0.055	0.294
	BDAC				0.063	0.05	0.064	0.071	0.05	0.071
	Perceived SCDT*BDAC							0.151*	0.072	0.105
	R^2		0.085		0.089			0.1		
	Adjusted R^2		0.082		0.084			0.092		
	<i>F</i>		33.951**		17.809**			13.454**		

ΔR^2	0.085	0.004	0.011
ΔF	33.951**	1.611	4.410*

* $p < 0.05$ ** $p < 0.01$

Source: Authors

Finally, to test Hypothesis H4, this study conducted a hierarchical regression analysis based on perception data (Hayes, 2018). The results show that in Model 1, when CDT was entered as the sole independent variable, its unstandardized coefficient ($B = 0.231, p < 0.01$) and standardized coefficient ($\beta = 0.249$) were both significant, explaining 6.2% of the variance in perceived CDE ($R^2 = 0.062$, adjusted $R^2 = 0.059$, $F = 24.138, p < 0.01$), indicating a significant positive perceived effect of CDT on CDE. In Model 2, the inclusion of BDAC as an additional independent variable led to a slight increase in perceived explained variance ($R^2 = 0.065$, adjusted $R^2 = 0.060$), but its direct perceived effect did not reach statistical significance ($B = 0.055, \beta = 0.057, p > 0.05$), and the improvement in model fit was limited. In Model 3, after adding the interaction term between CDT and BDAC, the interaction effect was statistically significant ($B = 0.169, p < 0.05; \beta = 0.126$), increasing the perceived explained variance to 7.8% ($R^2 = 0.078$, adjusted $R^2 = 0.071$) and significantly improving model fit ($\Delta R^2 = 0.013, \Delta F = 5.327, p < 0.05$). These results indicate that BDAC positively moderates the perceived relationship between CDT and CDE—meaning that when BDAC is high, organizational members generally perceive the positive effect of CDT on customer digital engagement as more pronounced—thus supporting Hypothesis H4. For the specific values, please refer to Table 11.

Table 11 - The table of the Moderation Effect Analysis Results

Dependent Variable	Independent Variables	Model 1			Model 2			Model 3		
		<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
CDE	Constant	3.004**	0.039	-	3.004**	0.039	-	3.046**	0.043	-
	Perceived CDT	0.231**	0.047	0.249	0.252**	0.051	0.271	0.203**	0.055	0.219
	BDAC				0.055	0.053	0.057	0.032	0.054	0.033
	Perceived CDT*BDAC							0.169*	0.073	0.126
	R^2		0.062			0.065			0.078	
	Adjusted R^2		0.059			0.060			0.071	
	<i>F</i>		24.138**			12.609**			10.281**	
	ΔR^2		0.062			0.003			0.013	
	ΔF		24.138**			1.075			5.327*	

* $p < 0.05$ ** $p < 0.01$

Source: Authors

4.6 Summary of Research Hypotheses

Table 12 - Summary of Research Hypothesis Testing Results

Number	Hypotheses	Results
H1	Employees' and managers' perceived customer data engagement (CDE) has a direct and significant positive effect on corporate performance (CP).	Support
H2	Employees' and managers' perceived customer data engagement (CDE) mediates the relationship between perceived corporate digital transformation (CDT) and corporate performance (CP).	Support
H3	Employees' and managers' perceived big data analytics capability (BDAC) positively moderates the relationship between perceived supply chain digital transformation (SCDT) and corporate performance (CP).	Support
H4	Employees' and managers' perceived big data analytics capability (BDAC) positively moderates the relationship between perceived corporate digital transformation (CDT) and customer data engagement (CDE).	Support

Source: Authors

5 DISSCUSSION

The discussion section interprets the empirical results in light of the theoretical framework and existing literature. It elaborates on how employees' and managers' perceptions of digital transformation, customer data engagement, and big data analytics capability collectively shape corporate performance. By connecting the findings with dynamic capability theory, the resource-based view, and information management perspectives, this section highlights both theoretical contributions and practical implications, while also addressing limitations and future research directions.

5.1 Theoretical contributions

This study advances the literature on digital transformation and supply chain management by emphasizing the perceived role of Big Data Analytics Capability (BDAC) in translating digital transformation initiatives into tangible organizational value. While prior research has predominantly focused on the technological aspects of digital transformation, our findings highlight that employees' and managers' perceptions of BDAC are equally critical in realizing performance improvements (Barney, 1991; Teece et al., 1997). Merely investing in digital infrastructure is insufficient; organizations must also develop analytical competencies and cultural readiness to leverage data effectively. This perspective aligns with the resource-based view and dynamic capability theory,

suggesting that BDAC functions as a higher-order capability that enables firms to adapt, integrate, and reconfigure resources to capture value from digital transformation.

In comparison with (Mikalef et al., 2019), our results corroborate the view that BDAC plays a critical enabling role; however, they diverge from studies such as (Wamba et al., 2020), which reported limited moderating effects of analytics capabilities in manufacturing contexts. This divergence may be attributable to the specific characteristics of the Chinese manufacturing industry, including rapid digital adoption, centralized decision-making, and strong government-driven industrial policies, which may amplify the perceptual salience of BDAC.

A plausible explanation for this amplification effect lies in the multi-layered mechanisms through which BDAC operates. First, BDAC enhances firms' sensing capability by enabling real-time monitoring of market signals, customer behavior, and operational anomalies, thus allowing organizations to detect transformation opportunities earlier. Second, it strengthens the seizing capability by providing advanced analytical models and predictive insights that support faster and more accurate strategic decisions. Third, BDAC facilitates resource reconfiguration by integrating data flows across functional silos, enabling cross-departmental coordination and rapid process adaptation. These mechanisms, when embedded in employees' and managers' daily practices, create a reinforcing loop in which data-driven insights continuously inform and refine digital transformation initiatives, thereby magnifying their ultimate impact on firm performance.

5.2 Practical implications

For practitioners, the results provide clear guidance for enhancing the effectiveness of digital transformation efforts. Managers should not only allocate resources to technological upgrades but also invest in human capital and advanced analytics tools. Training programs that build data literacy and analytical skills across 25reas25nte organizational levels are essential. Furthermore, fostering a data-driven culture where insights from analytics inform decision-making can strengthen the link between digital transformation and performance outcomes (Ivanov, 2020). Managers should ensure that investments in BDAC are aligned with business strategy and supply chain objectives, maximizing the value derived from customer data engagement and other digital initiatives.

These recommendations are directly supported by our quantitative findings, which indicate that BDAC significantly moderates the relationship between perceived digital transformation and both firm performance (CP) and customer digital engagement (CDE). In other words, organizations that combine technological investments with BDAC-oriented human capital development achieve stronger performance gains from digital transformation initiatives.

A balanced investment strategy is recommended, where organizations prioritize specific, high-impact interventions. These include: (1) implementing targeted training in advanced analytics and data interpretation for supply chain and operations teams; (2) embedding data-driven decision-making norms into corporate culture through leadership role modeling; and (3) focusing BDAC improvements on critical supply chain functions such as demand forecasting, supplier collaboration, and real-time inventory optimization, which have the highest potential to deliver measurable performance gains.

Our empirical evidence suggests that these targeted areas correspond to the operational dimensions where BDAC's moderating effect was most pronounced in the statistical models, making them the most effective leverage points for maximizing digital transformation outcomes.

5.3 Limitations

Despite its contributions, this study has several limitations. First, the use of cross-sectional survey data restricts the ability to establish causal relationships between variables. Second, the reliance on perceptual measures from employees and managers may introduce subjectivity and potential bias. Third, the sample, while diverse in ownership types and manufacturing sub-sectors, is limited to Chinese manufacturing firms, which may affect the generalizability of the findings to other contexts. Finally, the study does not account for potential industry-specific factors or longitudinal changes that may influence the observed relationships (Dubey et al., 2019).

Future research should adopt longitudinal designs to capture changes over time and enable stronger causal claims, as well as cross-country comparative studies to assess the role of institutional and cultural differences. In addition, mixed-method approaches could combine quantitative results with qualitative insights, revealing how BDAC is embedded and operationalized in different organizational contexts.

5.4 Directions for future research

Future research could adopt a longitudinal design to capture the dynamic nature of digital transformation and the evolving role of BDAC over time. Comparative studies across industries and countries would also help assess the generalizability of the findings and identify market-specific drivers of success. Additionally, qualitative approaches could be employed to gain deeper insights into how organizations develop and integrate BDAC into their strategic processes. Further investigations could also explore the interplay between BDAC and other organizational capabilities, such as innovation capability or change management, in shaping the value creation process from digital transformation (Kache & Seuring, 2017).

Moreover, future studies could examine how environmental factors—such as market turbulence, regulatory changes, and technological disruption—moderate the relationship between BDAC and performance outcomes. Researchers may also investigate sector-specific pathways, for instance, how BDAC capabilities are leveraged differently in discrete manufacturing versus process manufacturing. Finally, employing mixed-method research designs that integrate quantitative modeling with in-depth case studies could provide richer explanations for the mechanisms underlying BDAC's impact in various contexts.

6 CONCLUSION

This study investigates the perceived relationships among Corporate Digital Transformation (CDT), Supply Chain Digital Transformation (SCDT), Big Data Analytics Capability (BDAC), Customer Data Engagement (CDE), and Corporate Performance (CP) within the context of Chinese manufacturing enterprises. Anchored in the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT), the findings provide robust empirical evidence that employees' and managers' perceptions of digital transformation initiatives—particularly in corporate and supply chain domains—play a substantive role in shaping competitive advantage and corporate performance. Using quantitative survey data from 368 employees and managers, the results indicate that CDT and SCDT have significant direct impacts on CP, CDE serves as a partial mediator in the

CDT–CP relationship, and BDAC exerts a significant positive moderating effect, amplifying the performance benefits derived from transformation initiatives.

From a theoretical standpoint, the research extends RBV and DCT by conceptualizing BDAC as a higher-order dynamic capability that enables organizations to sense, seize, and reconfigure resources in digitally transformed environments. BDAC operates as a catalyst, aligning digital strategies with business objectives and systematically converting data assets into measurable performance outcomes. Importantly, these theoretical claims are empirically substantiated by our statistical results, which confirm that BDAC's moderating influence is both significant and operationally meaningful—especially within high-impact supply chain functions—thereby validating its positioning as a VRIN-aligned strategic capability rather than a mere technological resource.

From a practical perspective, the study offers actionable managerial implications, advocating a balanced investment strategy that complements technological upgrades with targeted development of analytical talent, data literacy, and decision-making cultures. Managers should embed BDAC development into the broader strategic architecture, prioritizing specific supply chain functions such as demand forecasting and real-time operational adjustments to maximize value from customer data engagement and other digital initiatives. These recommendations are not speculative but are directly derived from the empirical evidence that organizations with higher perceived BDAC levels capture disproportionately greater performance gains from digital transformation, making BDAC development a quantifiably high-return strategic priority.

Nevertheless, limitations include the cross-sectional design, reliance on perception-based measures, and the sample's restriction to Chinese manufacturing enterprises, which may limit generalizability. Future research should adopt longitudinal and cross-industry comparative designs, as well as mixed-method approaches, to further examine the dynamic interplay between technological resources, analytical capabilities, and performance outcomes.

In conclusion, this study not only affirms that technology is a necessary enabler in digital transformation but, more critically, demonstrates—through robust empirical analysis—that the decisive factor for sustained competitive advantage and performance improvement lies in an organization's perceived ability to interpret, integrate, and act

upon data in a strategically coherent manner. This unique empirical grounding strengthens both the theoretical and practical contributions of the research.

ACKNOWLEDGEMENT

The authors sincerely thank the faculty and colleagues of the Faculty of Business Administration, Dhonburi Rajabhat University, for their continuous guidance and valuable feedback throughout this research. Special thanks are also extended to the participating manufacturing enterprises and their employees and managers, whose time and insights made this study possible. The authors further express their gratitude to family and friends, whose support and encouragement have been an essential source of motivation in completing this work.

REFERENCES

- BARNEY, Jay. "Firm Resources and Sustained Competitive Advantage." *Journal of Management*, vol. 17, no. 1, 1991, pp. 99–120.
<https://doi.org/10.1177/014920639101700108>.
- BENDOLY, Elliot. "Linking Task Conditions to Performance Outcomes in Multi-task Work Settings: The Role of Information-Processing Requirements." *Journal of Operations Management*, vol. 27, no. 3, 2009, pp. 310–323.
- CHOO, Chun Wei. "The Knowing Organization: How Organizations Use Information to Construct Meaning, Create Knowledge, and Make Decisions." *International Journal of Information Management*, vol. 16, no. 5, 1996, pp. 329–340.
- DUBEY, Rameshwar, Angappa Gunasekaran, Stephen J. Childe, and Thanos Papadopoulos. "Big Data and Predictive Analytics and Manufacturing Performance: Integrating Institutional Theory, Resource-Based View and Big Data Culture." *British Journal of Management*, vol. 30, no. 2, 2019, pp. 341–361.
- EISENHARDT, Kathleen M., and Jeffrey A. Martin. "Dynamic Capabilities: What Are They?" *Strategic Management Journal*, vol. 21, no. 10–11, 2000, pp. 1105–1121.
- EKATA, N. "Information Management in Organizations: A Conceptual Framework." *Information Management Review*, vol. 28, no. 1, 2012, pp. 1–25.
- EREVELLES, Sunil, Nobuyuki Fukawa, and Linda Swayne. "Big Data Consumer Analytics and the Transformation of Marketing." *Journal of Business Research*, vol. 69, no. 2, 2016, pp. 897–904. <https://doi.org/10.1016/j.jbusres.2015.07.001>.
- GUPTA, Manish, and Joey F. George. "Toward the Development of a Big Data Analytics Capability." *Information & Management*, vol. 53, no. 8, 2016, pp. 1049–1064. <https://doi.org/10.1016/j.im.2016.07.004>.

HAIR, Joseph F., William C. Black, Barry J. Babin, and Rolph E. Anderson. *Multivariate Data Analysis*. 8th ed., Cengage Learning, 2019.

Hajli, Nick, Jonathan Sims, Ali H. Zadeh, and Marie-Odile Richard. "A Social COMMERCE Investigation of the Role of Trust in a Social Networking Site on Purchase Intentions." *Journal of Business Research*, vol. 68, no. 6, 2015, pp. 1084–1091.

HAYES, Andrew F. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. 2nd ed., The Guilford Press, 2018. <https://doi.org/10.4324/9781351045823>.

IVANOV, Dmitry, and Alexandre Dolgui. "Viability of Intertwined Supply Networks: Extending the Supply Chain Resilience Angles towards Survivability." *International Journal of Production Research*, vol. 58, no. 10, 2020, pp. 2904–2915. <https://doi.org/10.1080/00207543.2020.1750727>.

KACHE, Florian, and Stefan Seuring. "Challenges and Opportunities of Digital Information at the Intersection of Big Data Analytics and Supply Chain Management." *International Journal of Operations & Production Management*, vol. 37, no. 1, 2017, pp. 10–36.

MIKALEF, P., Ioannis O. Pappas, John Krogstie, and Michail Giannakos. "Big Data Analytics Capabilities: A Systematic Literature Review and Research Agenda." *Information Systems and e-Business Management*, vol. 16, no. 3, 2018, pp. 547–578. <https://doi.org/10.1007/s10257-017-0362-y>.

TEECE, David J., Gary Pisano, and Amy Shuen. "Dynamic Capabilities and Strategic Management." *Strategic Management Journal*, vol. 18, no. 7, 1997, pp. 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7)

WAMBA, Samuel Fosso, Rahul Dubey, Angappa Gunasekaran, and Shahriar Akter. "The Performance Effects of Big Data Analytics and Supply Chain Ambidexterity: The Moderating Effect of Environmental Dynamism." *International Journal of Production Economics*, vol. 222, 2020.

WARNER, Karl S. R., and Marcus Wäger. "Building Dynamic Capabilities for Digital Transformation: An Ongoing Process of Strategic Renewal." *Long Range Planning*, vol. 52, no. 3, 2019, pp. 326–349.

Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Xing, Y., & Wongkumchai, T. AMPLIFYING THE DIGITAL SUPPLY CHAIN MODEL: THE MODERATING ROLE OF BIG DATA ANALYTICS CAPABILITY ON PERCEPTIONS OF PERSONNEL IN THE MANUFACTURING INDUSTRY. *Veredas Do Direito*, e234369. <https://doi.org/10.18623/rvd.v23.n3.4369>