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공급자 및 고객통합이 IT 활용의 정도에 따라 외부 충격 흡수 능력에 미치는 영향에 관한 연구

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Exploring the Nexus of Supplier and Customer Integration: Unraveling the Impact on Disruption Absorption Capability with IT Alignment

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ABSTRACT

Purpose: This study explores how supplier and customer integration impact a firm's disruption absorption capability, with a focus on IT alignment moderation.

Methods: We conducted surveys with 296 Chinese manufacturers and utilized hierarchical regression for analysis.

Results: : Our results reveal a positive correlation between supplier/customer integration and disruption absorption capability. Additionally, positive IT alignment bolsters the relationship between supplier integration and disruption absorption capability, while it doesn't affect the link between customer integration and disruption absorption capability.

Conclusion: These findings underscore the significance of integration and IT alignment for enhancing a firm's disruption absorption capability, providing crucial insights for supply chain management practitioners.

Key Words: Supplier Integration, Customer Integration, IT Alignment, Disruption Absorption Capability

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1. Introduction

In today's dynamic business landscape, navigating operational and market challenges amidst disruptions is a paramount concern for managers striving to uphold business competitiveness. From demand uncertainties to natural disasters and regulatory shifts, supply chain managers encounter a diverse array of disruptions that can profoundly impact organizational resilience and performance. Supply chain integration, in response to these changes and uncertainties, has emerged as a critical strategic approach (Sabet et al., 2017), aiming to foster collaboration and streamline information flow among supply chain members.

Given the paramount importance of supply chain integration, previous research has extensively examined its effects on various facets of firm performance (He et al., 2017; Junaid et al., 2022; Oh, 2022). However, a significant gap exists in understanding its specific impact on disruption absorption capability. Understanding this impact is crucial because disruptions, whether arising from external factors such as natural disasters, pandemics, or wars, or internal supply chain breakdowns, pose substantial threats to a firm's operational continuity and market responsiveness (Yeo et al., 2023). While supply chain integration has been recognized as a driver for enhancing organizational performance in the literature on supply chain management and operations (Ralston et al., 2015), the extent to which integration strategies can bolster a firm's resilience in the face of disruptions remains largely unexplored. Moreover, the relative effectiveness of different types of integration, such as supplier integration versus customer integration, in enhancing disruption absorption capability remains unclear. Given the substantial investments required for integration efforts, empirical evidence on whether supplier integration, customer integration, or both are genuinely beneficial is crucial for firms to allocate their resources efficiently and maintain operational resilience amidst challenging supply chain disruptions. Because resilience is undeniably synonymous with organizational success, firms must possess the agility to rapidly adapt to unforeseen disruptions to ensure continuity and sustain competitiveness (Shukor et al., 2021). In this regard, supplier and customer integration play pivotal roles in fortifying a firm’s resilience by facilitating efficient communication, collaboration, and resource sharing across the supply chain (Shekarian and Mellat Parast, 2021). Therefore, comprehending how integration contributes to disruption absorption capability holds immense value for businesses seeking to fortify their resilience and mitigate the adverse impacts of disruptions.

Furthermore, this study aims to investigate how Information Technology (IT) alignment moderates the relationships between integration strategies and disruption absorption capability. Existing research has revealed that IT plays a pivotal role in supply chain operations, facilitating seamless communication and coordination (Abourokbah et al., 2023). When IT systems are aligned with suppliers and customers, they enhance a firm's capacity to manage information flow effectively, reduce uncertainty, and strengthen resilience to disruptions (Abourokbah et al., 2023). Examining the moderating impact of IT alignment is crucial for two key reasons. Firstly, IT alignment determines how well a firm's IT infrastructure aligns with its strategic objectives and operational processes. This alignment ensures that technology investments effectively support business goals and improve overall performance (Chin et al., 2022). Secondly, firms with

well-aligned IT systems are better prepared to adapt to dynamic market conditions and mitigate the impacts of disruptions (Song et al., 2024). Thus, IT alignment is expected to expedite the flow of information from suppliers and customers, enabling firms to process large volumes of data rapidly. This capability empowers firms to respond to external market changes more swiftly than their competitors, thereby enhancing resilience. Therefore, this study seeks to elucidate how IT alignment moderates the relationship between supply chain integration and disruption absorption capability, offering insights into how supply chain integration strategies can bolster resilience in the face of disruptions through IT alignment.

By delving into these intricate relationships, we endeavor to address the existing research gap and uncover the impact of supplier and customer integration on disruption absorption capability. Such insights have the potential to deepen our understanding of the symbiotic relationships among supplier integration, customer integration, IT alignment, and disruption absorption capability, offering strategic guidance for firms aiming to enhance their disruption absorption capabilities.

The paper's structure is as follows: Section 2 provides a comprehensive review of existing literature. In Section 3, we introduce the research framework and hypotheses. This sets the stage for Section 4, which outlines the methodology employed. Subsequently, in Section 5, we present the empirical results derived from hypothesis testing. Finally, Section 6 discusses both theoretical and managerial implications, followed by a consideration of limitations and suggestions for future research.

2. Literature review

2.1 Supply Chain Integration

The significance of supply chain integration in contemporary business practices is underscored by the acknowledgement of interdependence. This integration is pivotal as it aims to enhance organizational efficiency, flexibility, and resilience (Junaid et al., 2023), particularly in scenarios marked by uncertainty and disruption. Integrated supply chains enable effective risk management, rapid adaptation, and sustained operational efficiency (Shekarian and Mellat Parast, 2021).

Extensive prior research has examined various dimensions of supply chain integration, encompassing information, logistics, supplier, customer, and procurement integration (Prajogo et al., 2016). Huo (2012) further categorizes supply chain integration into Internal Integration (II), Supplier Integration (SI), and Customer Integration (CI), grouping SI and CI as External Integration (EI). EI involves translating organizational strategies into operational processes through collaboration with key suppliers and customers (Vanpoucke et al., 2014).

Positioned within the Resource-Based View framework (RBV) (Hart, 1995), this study suggests that a firm's sustained competitive advantage emanates from the acquisition, development, and deployment of resources meeting the VRIN criteria (i.e., valuable, rare, inimitable, and non-substitutable) (Huemer and Wang, 2021). Supplier integration provides access to unique resources from suppliers (Prajogo et al., 2021),

while customer integration focuses on tailoring offerings to precisely meet customer needs. This not only enhances responsiveness but also transforms customer relationships into valuable resources, fostering loyalty and positive word-of-mouth (Saleem et al., 2018).

The subsequent sections will delve deeper into the mechanisms and implications of supplier integration and customer integration, respectively.

2.2 Supplier Integration

Integration serves as a strategic imperative for firms seeking to excel in today's complex business landscape (Crane and Glozer, 2016). Within the realm of supply chain integration (SCI), supplier integration (SI) emerges as a cornerstone under external integration (EI), fostering collaboration between manufacturers and suppliers to align strategies, resources, and practices (Ataseven and Nair, 2017).

A wealth of research underscores the transformative impact of SI on a firm's operational and financial performance (Ataseven and Nair, 2017; Ralston et al., 2015). Notably, SI has been shown to mitigate system operating costs, transaction costs, and safeguard critical assets amidst uncertainty (Williamson, 1989). Moreover, studies reveal a positive correlation between elevated levels of integration with suppliers and amplified benefits (Wiengarten et al., 2016). SI spans diverse dimensions, including order processes, inventory management, production planning, technical support, and information exchange (Srinivasan and Swink, 2015), all of which can bolster strategic planning, process optimization, and information sharing.

Operating within the paradigm of the resource-based view (Hart, 1995), our study delves into these dimensions with conviction. Primarily, SI enables firms to secure unique resources from suppliers, fortifying their ability to weather disruptions in dynamic environments (Bolisani and Bratianu, 2017). Furthermore, SI fosters collaborative capabilities, strategically optimizing processes to confront supply chain risks head-on. Lastly, through information sharing, SI empowers firms with invaluable insights, enabling proactive decision-making to navigate uncertainties and conflicts with agility (Baah et al., 2022). These robust resources and capabilities derived from SI not only enhance a firm's resilience but also position it for sustained success in a volatile market landscape.

2.3 Customer Integration

In today's dynamic business landscape, successful customer integration (CI) emerges as a pivotal driver of competitive advantage. Research supports this notion, with studies by (Koufteros et al., 2005) demonstrating a positive correlation between CI and performance metrics like quality and innovation, while (Flynn et al., 2010) affirm its positive impact on operational performance.

CI surpasses mere personalized services, aiming to elevate information accuracy through effective data exchange. Highlighting its multifaceted nature (Frohlich and Westbrook, 2001), customer integration encompasses customer relationship management, strategic alliances, information sharing, communication, and process coordination (Colicchia et al., 2019; O'Dwyer and Gilmore, 2018). This research underscores the

importance of directing CI efforts towards information exchange, process coordination, and trust-building (Revilla and Knoppen, 2015).

First, effective information exchange involves sharing critical data such as inventory levels, production plans, market insights, and sales forecasts (Panahifar et al., 2018). By engaging in successful information exchange with customers, firms strategically enhance production planning, control inventory capacity, and address supply chain crises. Furthermore, information exchange mitigates the bullwhip effect and reduces exploration costs, thereby indirectly enhancing the dynamic capabilities of the supply chain (Jeong and Hong, 2019). Second, fostering process coordination between firms and customers, such as by establishing rapid ordering systems, can lead to heightened customer satisfaction, reduced errors, lower costs, and bolstered competitive advantages (Beheshti et al., 2020). Finally, building trust, such as by granting appropriate permissions to major customers, serves to enhance mutual trust, increase the credibility of customer-provided information, and foster long-term relationship development.

Overall, customer integration significantly enhances disruption absorption capability by fostering collaboration, improving information accuracy, enhancing responsiveness to market changes, and reducing inefficiencies throughout the supply chain.

2.4 Disruption Absorption Capability

Amidst the escalating demand for prompt and efficient product service levels in the market, the capability of firms to manage adverse impacts on the supply chain has become a focal point (Brandon-Jones et al., 2014). This capability, termed disruption absorption capability, has garnered attention. Disruptions encompass unforeseen events, risks, and unpredictable factors, both natural and human-induced, disrupting the supply chain (Chowdhury and Quaddus, 2017).

Prior research has extensively examined resilience and supply chain risk management (Ho et al., 2015): resilience underscores the supply chain's flexibility and adaptability, whereas supply chain risk management entails a systematic approach to identify, prevent, respond to, and analyze risks. In contrast, disruption absorption capability, which emphasizes a firm's effectiveness in managing and mitigating disruptions, uniquely focuses on minimizing their impact. In light of this perspective, Bhamra et al. (2011) assert the difficulty in enhancing resilience, emphasizing the broader significance of disruption absorption capability over supply chain risk control. Consequently, this study, framed within the resource-based view, underscores the pivotal role of disruption absorption capability.

2.5 IT Alignment

Information Technology (IT) encompasses the technological capabilities for acquiring, processing, and transmitting information, facilitating communication and coordination among all members of the supply chain. In today's landscape, IT permeates every facet of the supply chain, integrating critical information among partners. Previous research consistently highlights the positive influence of IT implementation on

supply chain integration, underscoring its pivotal role (Vanpoucke et al., 2017). However, early studies often treated IT as an independent resource, solely focusing on spending levels without considering its alignment with overall business processes (Wu et al., 2006). IT alignment ensures mutual support between a firm and its partners, coordinating integration efforts such as sharing production plans and demand forecasts (Datta and Christopher, 2011), consequently reducing errors and enhancing resource allocation efficiency. The Resource-Based View (RBV) theory emphasizes the complementarity of IT with organizational processes, practices, and activities (Barney, 1991; Wernerfelt, 1984). Therefore, this study investigates the moderating role of IT alignment within the RBV framework.

3. Hypothesis Development

3.1 The effects of supplier integration and customer integration on disruption absorption capability.

Suppliers and customers are fundamental components of the supply chain. According to the resource-based view, they contribute unique resources to the firm, thereby enhancing its disruption absorption capability. Integration, as argued by (Williams et al., 2017), equips firms with the ability to absorb disruptions. In this context, on the one hand, supplier integration can be seen as a strategic resource. The interconnected relationship between firms and suppliers serves as a conduit for acquiring essential resources and information (Shukor et al., 2021). Concurrently, this collaborative resource assists firms in addressing challenges related to raw materials, delivery times, and inventory management, which is particularly vital during disruptive periods (Katsaliaki et al., 2021). On the other hand, through customer integration, firms foster close relationships, gaining valuable information, building trust, and enhancing collaborative capabilities (Tarigan et al., 2021). This intimate integration can be seen as a unique resource, contributing to the enhancement of a firm's disruption absorption capability (Munir et al., 2020).

Moreover, dynamic capability theory provides unique insights into disruption absorption capability (Blome et al., 2013). In environments characterized by rapid market and technological changes, firms often encounter fluctuations and unpredictable events during strategic planning, highlighting the importance of adapting to these dynamic environments. Dynamic capability theory suggests that firms with the ability to continuously adjust and reallocate resources in response to changing circumstances are better equipped to absorb disruptions effectively (Song et al., 2024). Therefore, this theory can justify the effects of supplier and customer integration on disruption absorption capability. Consequently, this study proposes hypotheses H1 and H2:

H1: There exists a positive relationship between the level of supplier integration and a firm's disruption absorption capability.

H2: There exists a positive relationship between the level of customer integration and a firm's disruption absorption capability.

3.2 The moderation effects of IT alignment

From the RBV perspective, a firm's competitive advantage stems not only from the mere possession of resources but also from how these resources are effectively leveraged and integrated into the firm's operations (Furr and Eisenhardt, 2021). The strategic implementation of IT within the supply chain plays a crucial role in this integration process, enhancing the firm's ability to synchronize processes, share information, and collaborate seamlessly with partners (Salamah et al., 2023). This alignment of IT systems ensures that the resources obtained through supplier integration and customer integration contribute significantly to enhancing the disruption absorption capability of the firm. By fostering external partnerships and facilitating information exchanges, IT alignment enables the firm to capitalize on the synergies created by supplier and customer relationships (Trang et al., 2022).

By strengthening the alignment between IT systems and supply chain integration efforts, firms can capitalize on their existing resources more effectively. This alignment not only optimizes internal processes but also extends the firm's disruption absorption capability by fostering closer collaboration and information exchange with suppliers and customers. Thus, the following hypotheses are established:

H3a: The positive relationship between supplier integration and disruption absorption capability is strengthened when there is a high level of IT alignment with suppliers.

H3b: The positive relationship between customer integration and disruption absorption capability is strengthened when there is a high level of IT alignment with customers.

4. Research Methodology

4.1 Data collection procedures

This study explores the intricate relationships among supplier integration, customer integration, IT alignment, and disruption absorption capability in the Chinese manufacturing sector. To ensure accuracy, a structured questionnaire originally developed in English underwent meticulous translation into Chinese by bilingual experts. Subsequent pilot testing with six companies refined the questionnaire based on participant feedback, with email and WeChat channels established for clarification.

Utilizing a systematic sampling approach, the study identified target firms within a carefully constructed frame, including Chinese manufacturing firms categorized under various industry codes such as fashion apparel (Y75), pharmaceuticals (C10), electronics (L10), foods (X60), and automobiles (T40). This approach was chosen for its ability to provide a structured and efficient representation of Chinese manufacturing firms. To obtain a representative sample, a list of 2,000 Chinese manufacturing firms was obtained. The participants in this study were chosen from each company and occupied pivotal roles such as chief executive officers, vice presidents, directors, and operations officers. Their selection was based on their extensive knowledge and expertise in their respective firm's operational processes and capabilities.

Data collection began in August 2023, focusing on the identified sample list. Dillman's (2000) total design method (TDM) was employed for survey distribution, with a survey link emailed and three reminders sent at two-week intervals. While 965 out of the 2,000 firms approached agreed to participate, only 311 respondents completed the survey, resulting in a 15.85% response rate. After rigorous screening procedures, 15 responses were excluded due to reporting issues, ensuring that a total of 296 valid responses formed the basis for the final analysis. Detailed demographic characteristics, including industry types, firm size, firm age, and average annual sales, are presented in Table 1.

Table 1 The Sample Demographics (N=296)

		Frequency	Percentage
Industry Sectors	Fashion Apparel	39	13.2
	Pharmaceutical	35	11.8
	Electronic	91	30.7
	Foods	80	27.0
	Automobile	51	17.2
Firm Size (the number of the average employees)	<300	71	24.0
	300-500	40	13.5
	500-1000	26	8.8
	1000-2000	26	8.8
	> 2000	133	44.9
Firm Age	> 5 years old	37	12.5
	5-20 years old	130	43.9
	<20 years old	129	43.6
Average Annual Sales (hundred million CNY)	<5	79	26.7
	5-10	49	16.6
	10-30	32	10.8
	30-50	18	6.1
	>50	118	39.9

Source(s):Authors work

4.2 Measurement Items

This study developed Table 2 by synthesizing literature and theoretical frameworks. Key constructs were operationalized through survey items tailored to the research context's effectiveness and relevance. Supplier integration and customer integration were measured using items from Huo (2012), assessing participants' efforts and investments in these areas. Thirteen items for supplier integration focused on information exchange, strategic collaboration, and inventory sharing with suppliers, while nine items for cus-

tomer integration evaluated connectivity and communication with key customers. Disruption absorption capability, based on Essuman et al. (2020), was assessed using six items measuring the company's ability to function during disruptions. IT alignment, derived from Luftman et al. (2017), was measured using five items gauging alignment with partners, investments in IT, and resulting impacts. All items used a seven-point Likert scale. Furthermore, three control variables were included: firm size, annual average sales, and industry categorization. Detailed measurement items for each variable are presented in Table 2.

Table 2. Measurement Items and CFA Results

Construct and Items	Std. factor loadings	t-Value
Customer Integration (Cronbach's =.937 ; CR = .935 ; AVE = .616)		
1. The level of linkage with our major customer through information networks##	0.753	
2. The level of computerization for our major customer's ordering	0.783	0.063
3. The level of sharing of market information from our major customer	0.882	0.074
4. The level of communication with our major customer	0.848	0.068
5. The establishment of quick ordering systems with our major customer	0.841	0.080
6. Our major customer shares Point of Sales (POS) information with us	0.765	0.083
7. Our major customer shares demand forecast with us	0.699	0.092
8. Our firm share our available inventory with major customer	0.796	0.087
9. Our firm share production plan with our major customer	0.673	0.097
Supplier Integration (Cronbach's = .964 ; CR = .964 ; AVE = .961)		
1. The level of information exchange with our major supplier through information networks	0.737	0.059
2. The establishment of quick ordering systems with our major supplier	0.781	0.060
3. The level of strategic partnership with our major supplier	0.809	0.055
4. Stable procurement through network with our major supplier	0.782	0.054
5. The participation level of our major supplier in the process of procurement and production	0.843	0.055
6. The participation level of our major supplier in the design stage##	0.804	
7. Our major supplier shares their production schedule with us	0.871	0.048
8. Our major supplier shares their production capacity with us	0.864	0.057
9. Our major supplier shares available inventory with us	0.812	0.064
10. Our firm shares our demand forecasts with our major supplier	0.793	0.066
11. Our firm shares our inventory levels with our major supplier	0.851	0.059
12. Our firm shares production plans with our major supplier	0.844	0.060
13. Our firm help major supplier to improve its process to better meet our needs	0.849	0.060

Construct and Items	Std. factor loadings	t-Value
IT Alignment (Cronbach'a = .938 ; CR = .939 ; AVE = .754)		
1. Our firm's IT is well aligned with our partners (e.g., suppliers and customers)##	0.878	
2. Our firm invests in IT to align technology with our partners (e.g., suppliers and customers)	0.833	0.050
3. Our partners (e.g., suppliers and customers) invests in IT to align their technology with our firm	0.869	0.050
4. Both our firm and our partners (e.g., suppliers and customers) always work together for the best IT alignment	0.894	0.050
5. IT advances between our firm and our partners (e.g., suppliers and customers), are well aligned for best supply chain performance	0.867	0.049
Disruption Absorption Capability (Cronbach'a = .906 ; CR = .904 ; AVE = .615)		
1. Our firm is able to carry out its regular functions##	0.875	
2. Our firm grants us much time to consider a reasonable response	0.721	0.064
3. Our firm is able to carry out its functions despite some damage done to it	0.841	0.051
4. Our firm is able to meet normal operational and market needs without much deviation	0.865	0.051
5. Our firm performs well over a wide variety of possible scenarios without adaptations being necessary	0.647	0.070
6. Our firm's operations retain the same stable situation as it had before disruptions occur for a long time	0.727	0.068

Source(s):Authors work

Note : T value was not obtained for an item marked with ##, as its loading was intentionally fixed at 1 during the Confirmatory Factor Analysis

4.3 Construct validity

In preparation for hypothesis testing, we conducted Confirmatory Factor Analysis (CFA) using AMOS 22.0 to assess the unidimensionality of measurement items. CFA was prioritized over alternative techniques like coefficient alpha and exploratory factor analysis due to its more stringent interpretation of unidimensionality (Byrne et al., 1989). The results of the CFA, shown in Table 3, revealed favorable fit indices for all items, including $\chi^2/df = 2.784$, RMSEA = 0.078, CFI = 0.914, and IFI = 0.914. These robust fit indices supported the proposed measurement model and confirmed the unidimensionality of the measurement items. We further assessed the reliability of the constructs using Cronbach's alpha coefficient, which exceeded 0.9 for all constructs, ranging from 0.906 to 0.964. To examine convergent validity, we analyzed standardized factor loadings (SFL), Composite Reliability (CR), and Average Variance Extracted (AVE). SFL ranged from 0.673 to 0.894, CR values were satisfactory, ranging from 0.904 to 0.964, and AVE values ranged from 0.615 to 0.961, surpassing recommended thresholds (Fornell and Larcker, 1981). For discriminant validity, we compared the square root of AVE for each construct with squared correlations between constructs. The

lowest AVE value of 0.615 exceeded the highest squared correlation value of 0.593, confirming discriminant validity (Fornell and Larcker, 1981). These findings, presented in Table 3, underscore the validity and reliability of the constructs, ensuring the suitability of our measurement model for hypothesis testing.

Table 3. Descriptive Statistics and Correlation Matrix

Constructs	Mean	SD	1	2	3	4
Supplier Integration	5.091	1.227		0.593	0.358	0.295
Customer Integration	5.267	1.140	0.770**		0.347	0.341
IT Alignment	4.647	1.437	0.598**	0.589**		0.136
Disruption Absorption Capability	5.455	1.105	0.543**	0.584**	.369**	

Source(s): Authors work

Note. N = 296; **p <.01; *p <.05; SD stands for standard deviations; Correlations are below the diagonal and squared correlations are above the diagonal.

4.4 Assessment of nonresponse bias and common method bias

To mitigate bias, an analysis was conducted to compare early and late respondent groups in terms of demographic characteristics (Armstrong and Overton, 1977). This comparison revealed no significant differences between the two groups, indicating minimal bias. Furthermore, a comprehensive analysis was performed to assess common method bias, as recommended by Chang et al. (2020). This involved comparing structural equation models with and without a common latent factor representing method-specific variance. The results indicated that the inclusion of the common latent factor did not significantly improve the model fit, suggesting that common method bias is unlikely to have a substantial impact on the studied relationships.

5. Hypothesis Results

Through the Statistical Package for the Social Sciences (SPSS), we employed hierarchical regression analysis to rigorously assess our hypotheses. This method involves systematic variable blocking and stepwise testing to predict relationships between variables while controlling for other influences (de Jong, 1999). It allows for an in-depth exploration of complex relationships among variables, considering potential influences from different subgroups. Before hypothesis testing, we constructed four models to examine the impact of supplier integration and customer integration on disruption absorption.

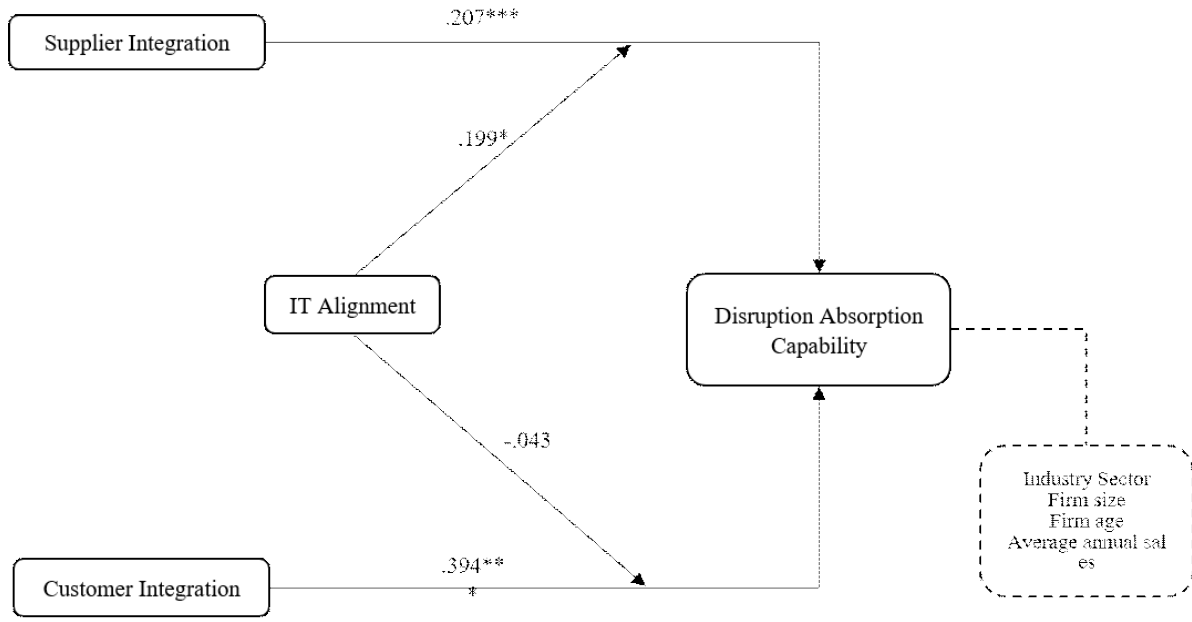
In Model 1, which included only control variables, firms with annual average sales between 10-30 million CNY showed statistical significance ($p < 0.05$). Model 2 introduced supplier integration and customer integration, revealing significant relationships with disruption absorption capability ($p < 0.01$ and $p < 0.000$, respectively), supporting Hypotheses 1 and 2. However, Model 3 found no significant relationship between IT alignment and disruption absorption capability. In Model 4, the interaction between supplier integration

and disruption absorption capability was significant ($p < 0.05$), while the interaction between customer integration and IT alignment was not significant ($p > 0.05$). Detailed regression results are presented in Table 4 and Figure 1.

Table 4. Regression Results

Constructs	Model 1		Model 2		Model 3		Model 4	
	β	VIF	β	VIF	β	VIF	β	VIF
Control Variables								
Fashion	.017	1.885	-.099	1.927	-.099	1.928	-.121	1.943
Electronic	.050	2.557	-.076	2.626	-.076	2.626	-.087	2.640
Foods	.029	2.462	-.170*	2.586	-.170*	2.586	-.173*	2.596
Automobile	.141	2.100	-.009	2.174	-.009	2.174	-.010	2.175
Firm size 300-500	-.097	1.398	.003	1.441	.002	1.451	-.018	1.498
Firm size 500-1000	-.095	1.479	-.020	1.546	-.020	1.548	-.043	1.569
Firm size 1000-2000	-.069	1.651	.025	1.717	.024	1.718	.009	1.726
Firm size >2000	.030	3.385	.058	3.479	.057	3.504	.049	3.520
Annual sales 5-10 million CNY	.153	1.563	.053	1.608	.054	1.632	.061	1.655
Annual sales 10-30 million CNY	-.079*	1.668	-.071	1.697	-.070	1.723	-.041	1.748
Annual sales 30-50 million CNY	-.018	1.469	-.074	1.489	-.073	1.510	-.053	1.523
Annual sales >50 million CNY	.117	3.421	-.046	3.564	-.044	3.683	-.022	3.699
Predictors								
Supplier Integration			.230**	2.657	.233**	2.840	.264***	2.928
Customer Integration			.415***	2.608	.418***	2.779	.441***	2.981
Moderator								
IT Alignment					-.009	1.756	-.048	1.802
Interaction Effects								
Supplier Integration * IT Alignment							.209*	4.315
Customer Integration *IT Alignment							-.023	4.269
R^2	.074		.394		.394		.427	
Adjusted R^2	.035		.364		.361		.391	
F Change	1.887		74.101		.021		7.927	

Note(s): 1.***p<0.001, **p<0.01, *p<0.05
Source(s): Authors work



Source(s): Authors work

Figure 1. Research Framework and hypothesis testing results

6. Discussions

6.1 Theoretical Implications

Our study offers significant contributions to the theoretical and managerial discourse surrounding supplier integration, customer integration, disruption absorption capability, and IT alignment. Through a comprehensive analysis of our research findings, we derive several theoretical implications.

Firstly, our study adopts a Resource-Based View (RBV) perspective, a mature theoretical framework that allows us to explore dimensions of external integration in the supply chain. This perspective enables us to delve into the creation of synergistic capabilities through integration with external partners, effectively addressing disruptions arising from uncertainty and risk. By introducing IT alignment as a moderating variable, we investigate its effects on the relationships between supplier integration, customer integration, and disruption absorption capability. Our research confirms the importance of both supplier integration and customer integration for disruption absorption capability, aligning with existing research and emphasizing their critical role in enhancing a firm's disruption absorption capability (Abourokbah et al., 2023).

Secondly, this study found that while IT alignment positively influences the relationship between supplier integration and disruption absorption capability, its impact on the relationship between customer integration and disruption absorption was not significant. Our study provides novel insights into the interplay between IT alignment, supplier integration, customer integration, and disruption absorption capability, particularly

within the unique context of Chinese manufacturing firms. Unlike previous research conducted in other contexts, our findings shed light on how distinct cultural factors and regulatory environments prevalent in China shape these relationships.

Chinese business culture places a paramount emphasis on personal relationships and guanxi (connections), prioritizing direct interpersonal communication and relationship-building with customers over heavy reliance on IT systems. This cultural inclination underscores the significance of traditional relationship-based approaches in Chinese business practices, potentially diminishing the perceived importance and effectiveness of IT alignment in enhancing disruption absorption capability within customer relationships. Moreover, China's stringent regulations regarding data privacy and security introduce additional complexities. Firms operating in China often adopt a cautious approach towards sharing sensitive information or conducting transactions through IT systems due to concerns about data breaches and regulatory compliance. These regulatory constraints may impede the full realization of IT alignment's potential to bolster disruption absorption capability within customer relationships, as firms navigate the delicate balance between leveraging technology and adhering to legal requirements.

By elucidating these cultural and regulatory dynamics, our study underscores the need for a nuanced understanding of IT integration strategies within the Chinese manufacturing context. It emphasizes the importance of aligning IT initiatives with cultural norms and regulatory frameworks to effectively enhance disruption absorption capability, offering valuable insights for practitioners and scholars alike in navigating the intricacies of supply chain management in China.

Lastly, our study underscores the significant impact of integration on a firm's strategic resources. By elucidating the resources brought about by supplier and customer integration, we strengthen a firm's disruption absorption capability. Our research introduces IT alignment as a crucial factor influencing disruption absorption, suggesting that businesses can enhance their disruption absorption capability by improving IT alignment with suppliers. We also suggest strategic adjustments based on the non-significant negative impact resulting from IT alignment in the context of customer integration (Salam and Bajaba, 2023).

6.2 Practical Implications

Our research provides invaluable insights for practitioners navigating the complex terrain of supplier integration, customer integration, and their impact on disruption absorption capability. Firstly, we illuminate the intricate interplay between supplier and customer integration processes and a firm's disruption absorption capability, offering strategic management perspectives. Managers are urged to recognize supplier and customer integration as pivotal instruments for securing unique resources vital for bolstering their resilience against disruptions. Secondly, our study sheds light on the nuanced dynamics of IT alignment within the RBV framework, advocating for its judicious and context-sensitive application. While IT alignment emerges as a potent facilitator of disruption absorption in supplier integration, its influence in customer integration contexts warrants careful consideration. Lastly, we advocate for strategic investments in IT and the cultivation of alignment with suppliers as means to fortify disruption absorption capabilities. By em-

bracing these recommendations, manufacturing firms can proactively navigate disruptions and emerge stronger in competitive landscapes.

In conclusion, our study represents a significant contribution to both theoretical understanding and practical application in the realms of supplier and customer integration and their ramifications on disruption absorption. Managers stand to gain invaluable insights from our research, empowering them to harness integration strategies as potent tools in steering their organizations towards sustainable competitive advantage.

6.3 Limitations and future research directions

This study has several significant limitations related to geographical scope, methodological approach, and theoretical framework. Firstly, our data collection focused exclusively on Chinese firms, limiting the generalizability of our findings. Therefore, caution is necessary when extrapolating our results to other international contexts, as different countries exhibit unique backgrounds and cultural differences impacting managerial decision-making. Future research should consider incorporating diverse cultural settings and national-level variables to provide a more comprehensive understanding and validation of the proposed relationships. Secondly, methodological constraints arise from the subjective rating scales used to measure a company's disruption absorption capability. Integrating objective scales and real-world data would enhance the reliability of our findings and mitigate concerns related to common method bias. Future research could include objective data points encompassing temporal, budgetary, and other relevant metrics to provide an objective assessment of a firm's disruption absorption capability. Additionally, expanding the sample size in subsequent research endeavors would enhance the robustness and generalizability of the proposed model. Finally, from a theoretical perspective, this study primarily focuses on the moderating effect of IT alignment on the relationship between integration mechanisms and disruption absorption capability. However, future research should explore other IT mechanisms, such as IT advancement, and their interactions with integration processes. Investigating these interactions and their complex relationships with disruption absorption capacity would advance our understanding of these dynamics and present a promising avenue for future scholarly inquiry.

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