RESEARCH PAPER

Large-Scale Project Supply Chain Management Empowered by New-Generation IT: A Study on the Strategic Value of Integrating Corporate Culture, Advertising, and AI in Shandong SMEs

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ABSTRACT
This study investigates the moderating effect of information technology in the interrelationship between corporate culture, advertising strategy, competitive advantage, and the effectiveness of strategic management in SMEs in Shandong Province, China. According to the resource-based theory and the dynamic capability theory, a moderated mediation model was proposed and empirically verified. Partial least squares structural equation modeling was adopted to test the research model with a sample of 255 participants in the manufacturing industry, service industry, and technology industry. The findings indicate that next-generation information technology moderates the corporate culture route and the advertising strategy route to competitive advantage in a positive way, indicating that the association between resources and performance is stronger for organizations that possess higher levels of IT adoption. Additionally, IT-mediated competitive advantage mediates the association between resources and effective strategic management in a way that is referred to as moderated mediation, where the indirect effect is stronger at higher levels of IT adoption. These results indicate that the competitive advantage of intangible organizational resources depends on the digital infrastructure in which these resources are developed and evaluated, and these results have significant implications for SME managers and policymakers concerned with the challenges associated with competition in large-scale project supply chains.

Keywords: new-generation information technology, corporate culture, competitive advantage, strategic management effectiveness, supply chain SMEs
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1. INTRODUCTION

Large-scale infrastructure and engineering projects are an important aspect of regional economic development in China, and in this case, SMEs play a vital role in such a complex supply chain, acting both as a supplier and a subcontractor to such projects. Shandong Province is one of the most economically dynamic regions in China, and it is known to have a high density of SMEs, which make a vital contribution to the construction and manufacturing industries in China [1]. However, the complexity involved in participating in project supply chains for these firms still persists. The procurement decisions made by project owners and general contractors are influenced by competition signals such as quality assurance, reputational credibility, and operational reliability; however, these small firms still struggle to communicate these signals. The crux of the issue is that it is not just about capability but also about visibility; hence, these SEMs need to find a way to leverage these organizational strengths into a competitive advantage that is visible to powerful purchasers in a high-stakes environment.

Among the internal factors that shape competitive positions, corporate culture is particularly a key factor that is not well understood and appreciated by many managers and scholars. According to the resource-based approach to the firm, culture is a rare and valuable resource that is hard for competitors to copy and that links employee behavior with organizational goals and institutionalization that larger rivals may not be able to provide [2]. The existing literature has empirically supported the strong association between organizational culture and organizational performance in the context of SMEs [3, 4]. Organizational culture has been identified as an important factor in building competitive advantage across various national contexts of SMEs [5]. What is not well understood is how the cultural competitive advantage is transmitted to external stakeholders, particularly in B2B contexts where information asymmetry is substantial and cultural signals are not easily observable.

Advertising strategy is found as a relevant complementary tool in such a context. When the corporate culture is the internal foundation of competitive advantage, the advertising strategy is the external projection of the same culture. In the context of the supply chain, the advertising

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strategy is found more as a reputational tool that conveys the credibility and reliability of the supplier to the potential buyer [6]. The evidence from the digitally intensive environment suggests that the SMEs that use the digital marketing tools achieve competitive advantage [7]. The emergence of next-generation information technologies such as artificial intelligence, cloud-based procurement and project management software, big data analytics, and real-time supply chain management technologies [8-10] has completely changed the environment for the deployment of cultural and advertising resources. Unlike other computerization or enterprise system implementations that are legacy in nature, these technologies enable resource-constrained firms to create, process, and communicate verifiable performance credentials to buyers in ways that were previously inaccessible to them [8, 10].

Although the topics of digital transformation and supply chain management have been the focus of increasing scholarly attention, empirical research on the influence of next-generation IT on the conversion of intangible organizational resources into competitive advantage is relatively scarce. For example, the research on the digitalization of the supply chain has mainly focused on the influence of the digitalization of the supply chain on the operation of the supply chain [11, 12], while the research on organizational culture and the influence of advertisements has regarded the influence of technology merely as a contextual setting rather than a dynamic factor that affects the conversion of intangible organizational resources into competitive advantage [13, 14]. The evolution of the resource side and technology side of this equation has therefore been a relatively isolated one from one another, and the issue is whether IT adoption enhances or alters the manner in which culture and advertising resources are converted to competitive advantage and strategic management in the context of SMEs in large-scale project supply chains.

This study aims to fill this gap by conducting a quantitative research on the moderating effect of new IT technology in relation to corporate culture, advertising strategy, competitive advantage, and strategic management efficiency in SMEs in Shandong Province. With an integrated framework of resource-based logic and dynamic capabilities perspectives, this study seeks to examine the impact of IT on the conditions in which resources in an organization generate a competitive return, in order to improve our understanding of digital empowerment in SME supply chains, and to offer useful insights to firms and policymakers in coping with the challenges of large project competitions [15, 16].

2. LITERATURE REVIEW AND HYPOTHESES

2.1 Corporate Culture and Competitive Advantage

The importance of corporate culture as a source of lasting competitive advantage is well established in the resource-based theory of the firm. As a reflection of the collective experiences of members of the organization, culture meets the fundamental requirements of strategic resource value in that it is scarce, differentiated, and difficult to imitate by competitors [2]. Empirical studies conducted in various contexts of SMEs have corroborated this theoretical assumption, as all studies have uniformly found that organizations whose cultures are more consistent with their strategic aspirations enjoy a stronger competitive position compared to those whose cultures are less consistent or weaker [3, 5].

What needs to be made clear are the circumstances under which this association is strengthened or weakened. In the framework of large-scale project supply chains, procurement decisions are characterized by significant information asymmetry, as general contractors and project owners need to make quality judgments regarding suppliers based on signals rather than actual experiences [17]. Corporate culture, as an intrinsic construct, does not necessarily emerge as a perceivable signal that can be accessed by external buyers. A supplier might enjoy a robust culture marked by high reliability, quality orientation, and cooperative tendencies; yet, if this culture cannot be credibly signaled to procurement decision-makers, the culture in question remains imperceptible in procurement relationships [18]. In this context, the ability to exploit culture as a lever for attaining competitive advantages is limited not by the quality of the culture in question but by its imperceptibility.

This requirement is addressed by next-generation IT solutions through a specific mechanism. The digital procurement platforms, project management systems, and AI-assisted evaluation tools provide a history of operations, thereby converting intangible aspects of culture into externalized and quantified performance data. This improvement in observability is significant in relation to competitive results, as procurement decisions are based on tangible qualities rather than hypotheses. With the increase in the adoption of IT, the buyer has access to greater and better quality information, and strong cultural SEMs are able to differentiate themselves in a manner that has a bearing on their competitiveness. Empirical studies on IT capabilities have shown that digital technologies increase the returns on firm resources in competitive markets by making the firm's strengths visible in the external market [19, 20]. In this respect, firms in the supply chain that have a higher prevalence of new-generation IT are found as having a higher level of linkage between corporate culture and competitive advantage on the grounds that digital technology reduces the observability gap between cultural resources and their market return. The above arguments and considerations suggest that new-generation IT acts as an amplifier of cultural resources in supply chain competition and thereby strengthens the process by which corporate culture converts to a source of competitive advantage. Accordingly, this study proposes:

H1: New generation IT has a positive moderating effect on the relationship between corporate culture and competitive advantage, suggesting that the positive impact

of corporate culture on competitive advantage is greater in SMEs with higher levels of IT adoption.

2.2 Advertising Strategy and Competitive Advantage

Empirical research has established a connection between advertising strategy and competitive advantage in various organizational settings. Within the SME sector, research findings show that firms with high advertising capabilities have a differentiated market position and high competitive performance [7, 14]. Nevertheless, in the context of large-scale project supply chains, the advertising-brand consciousness relationship is mediated by a unique mechanism. Advertising in the procurement context is not found as a tool for building brand awareness but rather a reputational signal that provides information to consumers who are uncertain about the supplier's competence and reliability in the vendor selection process [6]. Thus, the focus of the advertisement expenditures in B2B markets is not so much on the awareness generated but rather the information provided to the procurement decision-makers.

In terms of SMEs, translating spending on advertising into a form of competitive advantage via signaling effects faces a resource constraint. This is because, unlike larger firms, they often struggle with limited marketing budgets, access to professional expertise, and scope to sustain supplier positioning [21]. All these factors indicate that, in spite of a well-planned advertising strategy, it may not be possible to achieve a competitive return in relation to its set objectives. This is not due to the ineffectiveness of advertising as a marketing tool, but the fact that there are insufficient resources to support advertising in order to affect buyers' perceptions in a critical procurement situation. The empirical literature reveals that advertising and marketing capabilities are significant contributors to the competitiveness of SMEs, although limited by resource constraints [7, 14].

New-generation IT, such as AI-enabled advertising technologies, changes the rules of competition in that it reduces the resource base for effective signaling. Instead of needing to secure other resources to reach a larger audience, AI-enabled precision targeting and programmatic advertising allow resource-constrained firms to target the most relevant audience segments with the same level of investment. Moreover, studies on SMEs in emerging economies have shown quantified benefits to AI adoption in marketing activities, as it helps them to compete for buyer attention in a way that was previously only possible for larger and better-endowed competitors [22]. For SMEs that use higher levels of next-generation IT, the association between the advertising strategy and competitive advantage is expected to be higher, considering that the structural barriers that restrict the advertising strategy from achieving competitive advantage in the supply chain decrease with the help of digital technologies. Thus, the following is proposed:

H2: New generation IT has a positive moderating effect on the relationship between advertising strategy and competitive advantage, indicating that the positive relationship between the two variables is higher in SMEs with higher levels of IT adoption.

2.3 Competitive Advantage and Strategic Management Effectiveness

Competitive advantage is the central theme in the theory of strategic management and is not only an objective to be achieved but also a condition that affects the formulation of an enterprise's strategy. By correctly evaluating its position relative to rivals, an enterprise can make more deliberate and capability-aligned strategic decisions [23]. When an organization has a well-defined competitive advantage, the management can change from a reactive to a proactive stance, where the strategy is not only clear, well-funded, and well-executed but also based on a solid foundation rather than a constant reaction to every change in the marketplace.

A more specific articulation of the relationship between competition positioning and strategic efficacy can be found in the dynamic capabilities approach. This perspective argues that firms which enjoy a competitive advantage over time are those which are able to sense market opportunities, exploit such opportunities through timely commitment of resources, and finally transform internal firm capabilities to conform to environmental demands [24]. Each of these processes represents a distinct strategic management practice in its own right, suggesting a relationship between competition positioning and strategic efficacy. While a firm with a competitive advantage is in a position to utilize its slack resources, market intelligence, and stakeholder trust to undertake such abstract strategic processes, a firm without a competitive advantage is likely to suffer from a kind of strategic paralysis. This general proposition is corroborated by various empirical research in the context of SMEs, which show that competitive advantage indeed impacts firm performance in a positive manner, mediated by managers' strategic orientation and decision-making competence [25, 26].

2.4 The Moderating Role of New-Generation IT

The above sections show that new-generation IT acts as a moderator for both the corporate culture and competitive advantage relationship, and also for the advertising strategy and competitive advantage relationship. Before generalizing this to the entire performance pathway, it is, however, important to discuss the conceptualization of new-generation IT in this study. New generation information technology refers to an organizational competence encompassing the implementation and integration of sophisticated digital technologies, including AI-based decision support systems, cloud platforms for procurement and project management, big data analytics for supply chain monitoring, and real-time inter-organizational information systems [8, 9]. These enable firms to sense and process environmental information in ways that are not possible through conventional systems. This conceptualization is consistent with China's national policy framework for strategic emerging industries, where new-generation information technology is considered a

technology tier in its own right, including AI, cloud computing, big data, and the IoT, rather than a technology tier of digital infrastructure in general [10, 11]. Firms that are heavily dependent on traditional office productivity software, standalone accounting software, or non-integrated legacy enterprise systems are located on the lower end of this dimension, regardless of their level of IT spending. This boundary condition is critical to understanding the moderation effects discussed in the following sections. The amplification process in H1 to H4 refers to the advanced capability level rather than to IT adoption in general.

If the moderating variable modifies the association between the independent variable and the mediator, and then the mediator affects the dependent variable, it means that the indirect effect of the independent variable on the dependent variable depends on the level of the moderating variable. This is the idea behind the concept of moderated mediation, which suggests that the indirect effect depends on the conditioning variable [27]. In this context, if the next generation of information technology is expected to enhance the link between corporate culture and competitive advantage, then the indirect effect of corporate culture on the effectiveness of strategic management, with competitive advantage as a mediator, is expected to be more evident in SMEs with high levels of IT adoption compared to those with lower levels of IT adoption. This is also true in relation to the advertising strategy pathway. The moderating effect of IT is not limited to the development of competitive advantage, but it is propagated to affect the manifestation of organizational resources in strategic management via the mediating variable.

This propagation effect is underpinned by the concept of the dynamic capabilities framework, which treats information technology as an active capability that enables firms to sense, seize, and reconfigure resources to sustain performance advantages [24]. Thus, when an SME adopts next-generation IT to translate cultural strengths into credible competitive signals, the benefit is not merely to achieve a static positioning advantage. It identifies the necessary prerequisites for more informed strategic decisions, more confident resource allocations, and more integrated long-term planning strategies. In other words, the competitive advantage that is created by IT-enhanced cultural and advertising resources complements strategic management in a more powerful and clearer fashion than in a lower IT environment. Testing the empirical validity of full-chain moderation therefore represents a valuable extension of the moderation hypotheses developed in sections 2.1 and 2.2, and addresses the question of whether information technology investment generates benefits beyond those of competitive positioning to a scope of strategic governance. Accordingly, this study proposes:

H3: New-generation IT positively moderates the indirect effect of corporate culture on strategic management effectiveness through competitive advantage, where the indirect influence is greater for SMEs with a higher level of IT adoption.

H4: New-generation IT positively moderates the indirect effect of advertising strategy on strategic management effectiveness through competitive advantage, such that the indirect effect is stronger among SMEs with higher levels of IT adoption.

2.5 Conceptual Framework

Figure 1 presents the conceptual framework. The independent variables in the study are corporate culture and advertising strategy, the mediator variable is competitive advantage, and the dependent variable is the effectiveness of strategic management. The study's moderating variable is the new generation of IT and it specifically affects the two routes from corporate culture to competitive advantage and from advertising strategy to competitive advantage.

The framework is based on two theoretical arguments. The fundamental rationale for linking resources to competitive advantage is provided by the resource-based theory, while the dynamic capabilities theory provides a rationale for explaining how current information technology assists in maximizing the competitive benefits of resources [2, 24]. The moderated mediation model proposed in H3 and H4 extend the previous logic to the entire chain, suggesting that the impact of information technology-conditioned competitive advantage cascades to strategic management effectiveness, moderated by the extent of adoption of IT.

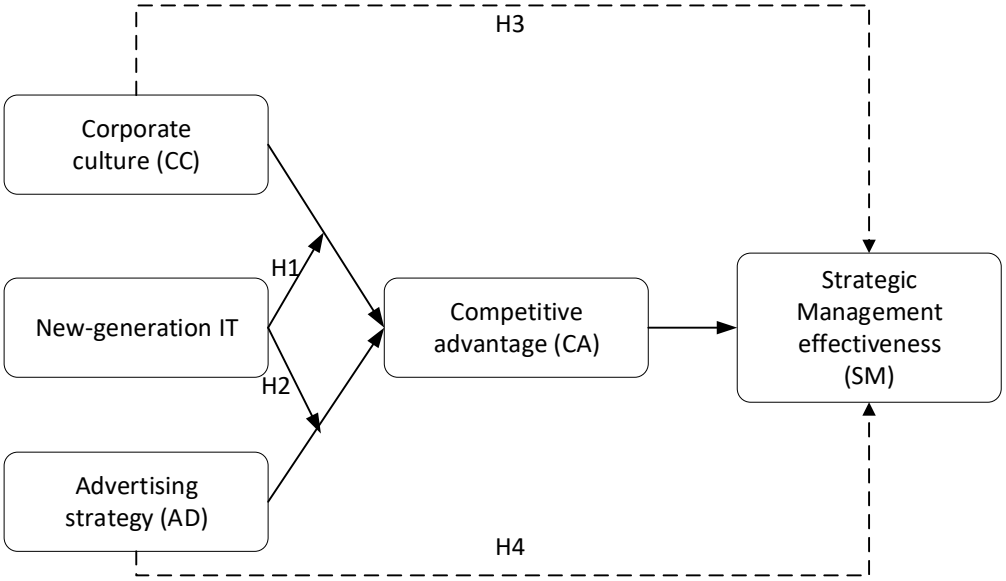

Figure 1. Conceptual framework

3. METHODOLOGY

3.1 Research Design and Sample

This study applied a cross-sectional quantitative survey design to examine the moderating effect of new-generation IT on the relationships among corporate culture, advertising strategy, competitive advantage, and strategic management effectiveness. Data collection was conducted among owners, senior management, and marketing practitioners in Shandong Province using a stratified random sampling technique. The sample was limited to firms that were part of large-scale project-based supply chains in three industry sectors that are relevant to the current study: manufacturing, services, and technology. The questionnaires were distributed through two methods: online, via Google Forms and Qualtrics, by sending emails and through LinkedIn and business networks; and hard copy, through business associations and by visiting SME premises. A total of 310 questionnaires were distributed, and the response rate was found to be 91.9% after retrieving 285 questionnaires. After eliminating 27 questionnaires due to significant missing data, response patterns, and ineligibility, and three multivariate outliers identified using Mahalanobis distance, the final sample consisted of 255 respondents. This study was carried out in accordance with the principles of the Declaration of Helsinki. The study was voluntary and anonymous, and informed consent was obtained from all participants before data collection. Ethical approval was granted by [University Name] Institutional Review Board (Approval No. [SDU-IRB-2025-098]).

Table 1 indicates the demographic characteristics of the sample. The largest proportion of the sample was from the manufacturing industry at 37.3%, followed by the service industry at 32.2% and the technology industry at 30.6%. The sample also showed that firms with 10-49 employees made up 60% of the sample, and the majority of the respondents were aged between 35-54 years. In addition, the sample was highly educated, with 87.1% of the sample having a bachelor's degree or higher, and 77.6% of the sample had more than ten years of professional experience, implying that the sample was composed of experienced managerial personnel who could provide valid assessments of the study's measures. To assess the risk of common method bias, Harman's single-factor test was conducted for all the 28 items. The first factor in the unrotated factor matrix accounted for only 22.7% of the total variance, which was far from the 50% threshold. This showed that common method bias did not affect the results in any way [28].

Table 1. Demographic profile of respondents (N = 255)

Variable	Category	n	%
Gender	Male	148	58.0
	Female	107	42.0
Age group	25-34 years	57	22.4
	35-44 years	99	38.8
	45-54 years	76	29.8
	55 years and above	23	9.0

Education	High school / diploma	33	12.9
	Bachelor's degree	127	49.8
	Master's degree	78	30.6
	Doctoral degree	17	6.7
Work experience	Less than 5 years	14	5.5
	5-10 years	43	16.9
	11-15 years	99	38.8
	More than 15 years	99	38.8
Industry sector	Manufacturing	95	37.3
	Services	82	32.2
	Technology	78	30.6
Company size (employees)	10-49	153	60.0
	50-100	53	20.8
	101-200	35	13.7
	201-249	14	5.5
Geographical location	Urban	159	62.4
	Rural	96	37.6
Years of business operation	5-10 years	57	22.4
	11-15 years	92	36.1
	16-20 years	76	29.8
	More than 20 years	30	11.8
Total		255	100.0

Note. *Percentages may not sum to exactly 100.0 due to rounding.*

3.2 Measures

All the constructs were measured using five-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree). A summary of the measurement constructs is provided in Table 2. Corporate culture was measured using six items [29, 30], encompassing shared values, behavioral norms, cultural cohesion, and adaptability. Advertising strategy was measured using five items [31] , encompassing advertising investment intensity, utilization of digital channels, multi-channel integration, and strategy alignment. Competitive advantage was measured using five items [2, 23], encompassing market positioning, inimitable resources, reputational benefits, and innovation-based competitiveness. Strategic management was measured using six items [24], encompassing strategic goal integration, market responsiveness, flexibility, employee strategic involvement, and strategic refinement. The adoption of new-generation IT was measured by using six items based on existing frameworks of IT capabilities [9, 19]. As conceptualized in section 2.4, these items were designed to measure respondents' firms' adoption of AI-based decision-making tools, cloud-based procurement and project management solutions, big data analytics solutions for monitoring operations, and real-time information integration between firms. Those items that related exclusively to basic computerization, standard office software packages, or non-integrated legacy systems were not included in the scale, thereby ensuring that the operationalization maps correctly onto the advanced digital capability tier suggested by the literature. Content validity for all scales was established by expert panel review prior to data collection.

Table 2. Summary of measurement constructs

Construct	Role	Items	Scale source
Corporate culture (CC)	IV	6	Cameron and Quinn (2011); Xenikou and Furnham (2022)
Advertising strategy (AD)	IV	5	Kotler and Keller (2016)
Competitive advantage (CA)	MV	5	Barney (1991); Porter (1985)
Strategic management effectiveness (SM)	DV	6	Teece (2007)
New-generation IT	MOD	6	Trieu et al. (2023); Awamleh and Ertugan (2021)

Note. *IV = independent variable; MV = mediating variable; DV = dependent variable; MOD = moderating variable. All items measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).*

3.3 Analytical Approach

This study employed partial least squares structural equation modeling and utilized the software SmartPLS 4.0 to test the suggested hypotheses. Following the suggested two-stage method [32], the first stage entailed testing the measurement model in terms of indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. For internal consistency, Cronbach's alpha, composite reliability, and Dijkstra-Henseler's rhoA were employed, with a minimum of 0.70 required for each of these measures to be acceptable. To test convergent validity, average variance extracted was applied, with a minimum of 0.50 required to be acceptable [33]. Discriminant validity was tested using the HTMT, with a score of less than 0.85 required to be acceptable [34].

The second stage involved the testing of the structural model and the four moderation and mediated-moderation effects. The moderation effects were examined using the standardized product indicator method to compute the interaction terms between new-generation IT and the independent variables. Bootstrapping with 5,000 subsamples was used to obtain bias-corrected 95% confidence intervals for all paths, interaction terms, and indirect effects. Significance was determined when the t-values were higher than 1.96 and when the confidence intervals did not contain zero [32]. Moderated mediation was assessed with the index of moderated mediation, and a confidence interval that did not contain zero was the criterion for significance [27]. The effect sizes were measured by Cohen's f^2, with an effect size of 0.02, 0.15, and 0.35 indicating a small, medium, and large effect, respectively [35].

4. RESULTS

4.1 Measurement Model Assessment

The measurement model was first tested before testing the structural model to confirm that all the constructs were within acceptable levels of reliability and validity. As indicated in Table 3, all the loadings for the five constructs were between 0.713 and 0.876, all above the minimum required level of 0.70. The internal consistency was also within acceptable levels, as indicated by the range between 0.873 and 0.912 for Cronbach's alpha and between 0.906 and 0.934 for composite reliability. Out of the five constructs, competitive advantage had the strongest reliability estimates, whereas the values for the construct of advertising strategy, due to its multi-dimensional nature, recorded the lowest values, though again these were well within the acceptable limits. The values for average variance extracted were well above 0.50 for all the constructs, with the range being from 0.623 to 0.714.

Table 3. Measurement Model Results and Descriptive Statistics

Construct	Items	Mean	SD	Loading Range	α	CR	AVE
Corporate culture (CC)	6	3.74	0.71	0.724-0.863	0.891	0.921	0.658
Advertising strategy (AD)	5	3.61	0.74	0.718-0.851	0.873	0.906	0.623
Competitive advantage (CA)	5	3.82	0.68	0.741-0.876	0.912	0.934	0.714
Strategic management effectiveness (SM)	6	3.57	0.72	0.733-0.864	0.904	0.927	0.647
New-generation IT	6	3.48	0.76	0.713-0.843	0.881	0.913	0.635

Note. *N = 255. All items measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Loading Range = minimum to maximum standardized indicator loading. α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted. All constructs meet recommended thresholds of α > 0.70, CR > 0.70, and AVE > 0.50.*

Discriminant validity was checked using the heterotrait-monotrait ratio of correlations (HTMT), and the results are presented in Table 4. All HTMT values were below the recommended threshold of 0.85 [34], indicating satisfactory discriminant validity. The highest value was 0.741 for competitive advantage and corporate culture. Based on the descriptive statistics, competitive advantage has the highest mean value among the five dimensions, at 3.82, while new generation IT has the lowest mean value at 3.4. This indicates that even though the firms perceive the competitive position favorably, the use of new generation IT is relatively low. The results for the measurement model provide a validation of all the dimensions' reliability and a sufficient basis for the estimation of the structural model.

Table 4. Heterotrait-Monotrait (HTMT) Ratio Matrix

	CC	AD	CA	SM	IT
CC	—				
AD	0.623	—			
CA	0.741	0.694	—		
SM	0.681	0.612	0.703	—	
IT	0.598	0.574	0.641	0.627	—

Note. *CC = corporate culture; AD = advertising strategy; CA = competitive advantage; SM = strategic management effectiveness; IT = new-generation IT. All HTMT values below the threshold of 0.85, confirming discriminant validity. Estimates based on bootstrapping with 5,000 subsamples.*

4.2 Structural Model Results

As reported in Table 5, the structural model yielded significant positive coefficients for all three paths. Corporate culture had the strongest effect on competitive advantage (β = 0.412, t = 7.10, p < 0.001), followed by advertising strategy (β = 0.378, t = 5.91, p < 0.001); bootstrapped confidence intervals excluded zero in both cases. Competitive advantage had a significant positive impact on strategic management effectiveness (β = 0.389, t = 6.38, p < 0.001), thereby lending credence to the empirical veracity of the proposed mediation path. The effect sizes for all three paths remained in the medium range, while the model explained 53.0% of the variance in competitive advantage and 41.2% of the variance in strategic management effectiveness. Overall, these findings serve to reinforce that the critical relationships proposed in the model are robust and provide the necessary base for the proposed moderation and moderated-mediation tests that follow.

Table 5. Structural Model Path Coefficients

Path	β	SE	t-value	p-value	95% CI LL	95% CI UL	f^2
CC → CA	0.412	0.058	7.10	< 0.001	0.298	0.526	0.203
AD → CA	0.378	0.064	5.91	< 0.001	0.252	0.504	0.169
CA → SM	0.389	0.061	6.38	< 0.001	0.269	0.509	0.184

Note. *β = standardized path coefficient; SE = standard error; f^2 = Cohen's effect size; CI LL = confidence interval lower limit; CI UL = confidence interval upper limit. R^2(CA) = 0.530; R^2(SM) = 0.412. All estimates based on bootstrapping with 5,000 subsamples (bias-corrected 95% CI). All paths significant at p < 0.001.*

4.3 Moderation Effects

The moderating effect of new generation information technology was tested using the standardized product indicator method, and the results are presented in Table 6. There was a significant impact of new generation information technology and corporate culture on competitive advantage (β = 0.183, t = 3.21, p = 0.001, f^2 = 0.086), thus supporting H1. Similarly, the relationship between next-generation IT and advertising strategy was significant (β = 0.162, t = 2.75, p = 0.006, f^2 = 0.071), thereby supporting H2. Both effect sizes fell within the small-to-medium range, which is consistent with moderation effects in organizational research. The inclusion of both moderator relationships increased the variance in competitive advantage from 0.530 to 0.547.

Table 6. Moderation Effects of New-Generation IT (H1 and H2)

Interaction Term	β	SE	t-value	p-value	f^2	Decision
CC × IT → CA	0.183	0.057	3.21	0.001	0.086	H1 Supported
AD × IT → CA	0.162	0.059	2.75	0.006	0.071	H2 Supported

Note. *β = standardized path coefficient; SE = standard error; f^2 = Cohen's effect size. Interaction terms constructed using the standardized product indicator approach. R^2(CA) = 0.547 with moderator included, compared to 0.530 without. All significance levels based on bootstrapping with 5,000 subsamples (bias-corrected 95% CI).*

Figure 2 provides simple slope plots to aid in understanding the nature of these relationships. In both paths, the relationship between the independent variable and competitive advantage is much stronger at high levels of IT adoption compared to low levels, with the gap between the two lines widening as the values on the predictor increase. This moderating effect appears slightly more pronounced in the relationship between the corporate culture pathway (high IT: β = 0.595; low IT: β = 0.229) compared to the advertising strategy pathway (high IT: β = 0.540; low IT: β = 0.216), which supports the argument that corporate culture has a stronger relationship to competitive advantage.

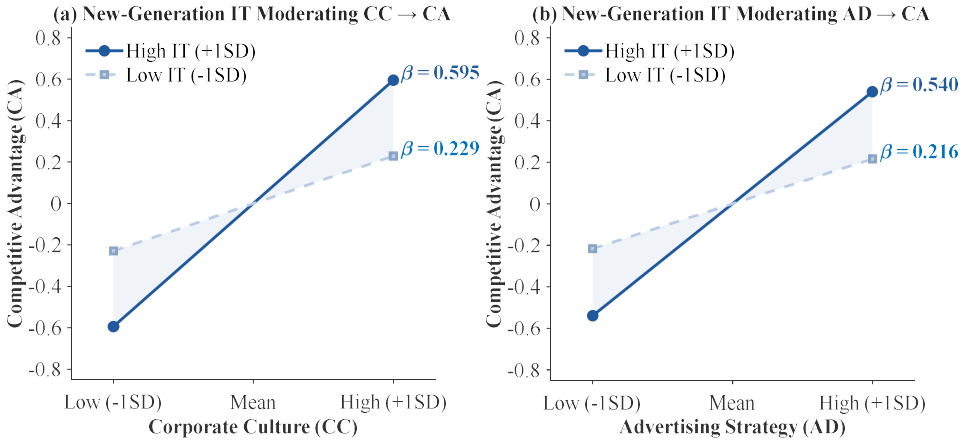

Figure 2. Moderating Effects of New-Generation IT on the Resource-Competitive Advantage Pathways

4.4 Moderated Mediation Effects

For moderated mediation, this was assessed by means of an index of moderated mediation, with 95% confidence intervals obtained via bootstrapping. Conditional indirect effects were calculated for low, mean, and high levels of new generation IT adoption, and the findings are presented in Table 7.

Table 7. Moderated Mediation Results (H3 and H4)

	IT Level	Indirect Effect	SE	95% CI LL	95% CI UL
H3: CC→CA→SM	Low (−1SD)	0.089	0.033	0.022	0.156
	Mean	0.160	0.034	0.094	0.228
	High (+1SD)	0.231	0.044	0.150	0.318
	IMM	0.071	0.027	0.023	0.134
H4: AD→CA→SM	Low (−1SD)	0.084	0.028	0.021	0.149
	Mean	0.147	0.032	0.087	0.211
	High (+1SD)	0.210	0.040	0.133	0.294
	IMM	0.063	0.026	0.019	0.121

Note. *IT = new-generation IT; IMM = index of moderated mediation; CI LL = confidence interval lower limit; CI UL = confidence interval upper limit. All estimates based on bootstrapping with 5,000 subsamples (bias-corrected 95% CI). IMM confidence intervals excluding zero confirm statistically significant moderated mediation.*

Under low IT conditions, the indirect effect of corporate culture on the effectiveness of strategic management through competitive advantage was 0.089, which increased to 0.160 at the mean level and 0.231 at high levels of information technology adoption. All three results were found to be statistically significant. The results for the index of moderated mediation were 0.071, which was found within a 95% confidence interval of [0.023, 0.134] that did not contain zero. This confirmed that the mediated pathway strengthens substantially as IT adoption increases. H3 is therefore supported. A similar pattern was observed for Hypothesis 4, where the indirect effects were 0.084, 0.147, and 0.210 for the three levels of information technology, respectively. In this case, the index of moderated mediation was 0.063 (95% CI [0.019, 0.121]). H4 is supported.

Across both pathways, the indirect effects roughly doubled when moving from low to high IT adoption, and the direction of the gradient was consistent across all estimates. The H3 pathway remained marginally stronger throughout, which was expected, given that the baseline relationship between corporate culture and competitive advantage was stronger than that of advertising strategy.

5. DISCUSSION

The overarching theme within all of the findings was that next-generation IT does not generate organizational resources, but rather modifies the context in which a return on those resources can be obtained. Both corporate culture and advertising strategy are established antecedents of competitive advantage, but within the context of supply chain procurement, their ability to generate a return has been limited by a fundamental information issue. In terms of unfamiliar suppliers, a buyer cannot observe a firm's cultural coherence or sophistication of advertising strategy. Which digital procurement platforms and AI-supported evaluation tools make these characteristics visible. Budler et al. demonstrated that transparency-enhancing technologies restructure supply chain information flows by making previously inaccessible supplier characteristics visible to buyers [36], which aligns

with the moderation effect identified in H1. A small or medium-sized enterprise with a strong culture in a high IT environment can make information visible that the SMEs in a low IT environment cannot, and this leads to a measurable gap in competitiveness.

The advertising result follows a similar yet slightly differentiated pattern of reasoning. With regard to SMEs, the obstacle was not the quality of the message itself but rather the structural disadvantage in accessing procurement attention with a fraction of the resources that larger players had access to. Cao and Weerawardena demonstrated that digital technologies enable SMEs in B2B settings to reach relevant target groups with a precision previously constrained by budget limitations [37]. In terms of supply chain procurement, where the emphasis of the goal lies more on credibility than expansive visibility, such a shift holds great significance. A SME which can target its advertising to appropriate procurement officers at appropriate times is not merely achieving a more efficient pattern of expenditure. It is operating a completely different form of competition from what would be possible without such a tool, a distinction which is captured by the interaction effect as discussed in H2.

However, what is theoretically more intriguing is that these effects are not limited to the concept of competitive advantage. The results for moderated mediation show that when information technology plays a role in shaping the way in which the firm's competitive position is formed, then the effectiveness of strategic management translates with much greater intensity compared to when information technology does not play an important role. The gap between low and high IT adoption firms is significant enough to support the existence of two separate strategic infrastructures. Teece's foundational work established that dynamic capabilities enable firms to proactively sense and seize opportunities [24], a capacity that Ellström et al. showed is further strengthened through digital transformation [38]. In the context of the SME supply chain, these studies offer empirical evidence to support the aforementioned proposition, especially in light of the uneven progress between competitive position and strategic effectiveness that cannot be entirely attributed to resource endowments.

There are significant limitations to the inferences that these findings can support. The cross-sectional design limits causal inference, and the geographic concentration of the sample in Shandong Province raises concerns about external validity — particularly given that Wang and Esperança and Jia et al. documented significant heterogeneity in the benefits of digital transformation across different SME types and business environments in China [39, 40]. The moderation effects found are not large, which should serve to temper any tendency to view information technology adoption as a transformative phenomenon alone. Instead, IT adoption should be considered as a single contingency factor among several, and future research would benefit from examining whether certain types of IT have effects that differ not only in degree but also in type.

6. CONCLUSION

This study set out to examine whether new-generation IT affects the nature of corporate culture and advertising strategy in their contribution to competitive advantage and, in turn, strategic management in SMEs in Shandong. The findings confirms this proposition with all four research hypotheses substantiated. IT adoption does not simply act as a standalone motivator of competitive performance, but rather alters the benefits of existing organizational resources to a firm. IT adoption makes cultural strengths in a firm's procurement situations more visible and allows advertising expenditures to be targeted more accurately to the most powerful buyers. Furthermore, the moderated mediation findings build upon this logic by suggesting that the benefits of IT-facilitated competitive performance extend beyond market benefits to impact strategic planning and implementation by firms.

The theoretical contribution of this study lies in its attempt to conceive of information technology as a contingency that influences the translation of resources into performance rather than as a resource itself. The managerial question is no longer whether to invest in culture or in technology but rather how these two factors interact with each other. A firm with genuine cultural strengths or well-thought-out advertising may achieve an entirely dissimilar competitive position when combined with the digital infrastructure required to make these strengths visible and targetable. For those charged with creating policies to encourage SME involvement in large project supply chains, the above relationship may be considered a framework for creating IT adoption strategies, as the payoff for IT investments appears to be heavily dependent upon organizational resources already in place.

The most promising direction for future research is to decompose the construct of new-generation information technology and investigate whether various types of AI-assisted procurement systems, various types of cloud-based project management systems, and various types of real-time data integration systems have various types of moderating effects. This study does not investigate various types of information technology and their effects at various stages of the resource-to-strategy process.

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