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Technological Configuration Capability, Strategic Flexibility, and Organizational Performance in Chinese High-Tech Organizations

Jin Li ¹, Lulu Zhou ², Xufan Zhang ^{3,*}, Zhihong Chen ⁴ and Feng Tian ⁵

¹ School of Business, Nanjing Normal University, Nanjing 210023, China; 54185@njnu.edu.cn

² School of Economics and Management, Southeast University, Nanjing 210096, China; 103006540@seu.edu.cn

³ Ginling College, Nanjing Normal University, Nanjing 210097, China

⁴ Institute for International Students, Nanjing University, Nanjing 210093, China; chzh@nju.edu.cn

⁵ Business and Law, University of Newcastle, Newcastle, NSW 2308, Australia; Feng.Tian@newcastle.edu.au

* Correspondence: 45228@njnu.edu.cn

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Abstract: The purpose of this study was to investigate the moderating effect of corporate technology configuration capability on the relationship between strategic flexibility and organizational performance throughout the different stages of the technological life cycle. By empirically examining 439 Chinese high-tech organizations, we found that technological configuration capability enhances the effect of strategic flexibility on organizational performance in a complex dynamic environment. However, different impacts were observed on the different stages of the technological life cycle. In addition, we explored the strategic flexibility during the different stages of the technological life cycle based on our empirical study.

Keywords: strategic flexibility; technology configuration capabilities; organizational performance; complex-dynamic environment; Chinese high-tech organizations

1. Introduction

China's rapid economic development is undergoing a transformation from "paying attention to quantity" to "improving quality" by developing high-tech companies and promoting innovation-driven development strategies [1]. However, maintaining a long-term sustainable competitive advantage is difficult for high-tech firms due to an inability to adapt to high-velocity environments [2,3]. As one type of dynamic skill, strategic flexibility enables firms to achieve a competitive advantage in turbulent markets [4]. As such, strategic flexibility is one type of complementary organizational capability that can help the firm to fully exploit its key resources when used in combination [5,6]. To meet the requirements of fast knowledge diffusion given market demands, high-tech firms must develop dynamic capabilities that enable them to reconfigure their resources and adapt to changing environments [7].

Previous studies considered some antecedents of strategic flexibility, such as human resource capabilities [8], top management team (TMT) [9], firm resources [10], and business model innovation [11]. The strategic flexibility literature emphasizes the flexible use of resources and the reconfiguration of processes, which helps firms to break down institutional routines and enhance their abilities to deploy and use various resources and know-how [12,13]. Another study explored the effect of strategic flexibility, especially in relation to organizational performance [14–19].

However, although strategic flexibility is considered an organization's capability to identify major changes in its external environment [20], empirical studies reported controversial results regarding the relationship between strategic flexibility and firm performance. In other words,

having strategic flexibility is not sufficient for gaining a sustainable competitive advantage [21] and the impact on firm performance is context-dependent [22,23]. Hence, further investigating the conditions under which dynamic capabilities can perform better is necessary [9,24]. Many present studies neglected the fact that high-tech firms need to be strategically flexible to adapt to unanticipated situations and rapidly changing environments, while also optimizing their business processes to achieve operational efficiency [25]. Prior literature also claimed that firms with efficient operational management benefit from dynamic capabilities, such as strategic flexibility, in turbulent environments from the resource-based theory perspective [21].

Therefore, determining how to develop the flow rather than the storage of organizational technological ability for high-tech enterprises is essential. As a measurement of operational efficiency, technological configuration capabilities (TCC) reflect the flow capability of grabbing new market opportunities to deploy or combine organizational technological asset structures through integrating internal and external technological resources [26], including obtaining, developing, and maintaining the combination of organizational resources and capabilities [25]. Hence, TCC is, similar to strategic flexibility, “a necessary, but insufficient, condition for sustained competitive advantage” [27], but is different from strategic flexibility, which focuses on how to improve practical operational management efficiency.

Despite the importance of context, the boundary conditions or the context under which strategic flexibility should work are not fully understood [21]. For different types of enterprises, the impact of strategic flexibility processes and mechanisms are different. Based on the resource-based view and the capabilities perspective of the firm, we attempted to analyze the relationship between strategic flexibility and organizational performance in a more dynamic analysis framework. Overall, this paper has three objectives. Firstly, we wanted to determine the role of organizational technological configuration capabilities in the process of effective strategic flexibility on organizational performance. Secondly, we investigated if this influencing process and vigor change in a complex dynamic environment. Thirdly, we examined the characteristics of strategic flexibility during different stages of the technological life cycle in a longitudinal study. Accordingly, we used new high-tech enterprises in China as the samples to examine empirically the hypothesis proposed through a literature review and theoretical deduction, with the aim of obtaining a more scientific and explicit examination, and explaining the relationship of a complex and dynamic environment with strategic flexibility and organizational performance.

2. Theoretical Analysis and Research Hypothesis

2.1. Strategic Flexibility and Organizational Performance

From the competition resource-based perspective, strategic flexibility can be deemed a kind of complementary organizational capability that can help firms achieve the full potential of their resource stocks and flexible management skills, resulting in better performance [7,28,29]. Resource flexibility is decided by the nature of the resource itself, whereas coordination flexibility reflects the ability of a corporation to use its resources [30]. In emerging countries such as China, where the external resource base is low [31], strategic flexibility, as a dynamic skill, significantly contributes to a firm’s performance by implementing deliberate changes enabling the firm to adjust to a turbulent environment [32].

According to these definitions, strategic flexibility can improve the effectiveness of plans, decisions, and strategies [15,33]. Strategic flexibility helps firms sense environmental changes [30], overcome organizational inertia [7], stimulate creativity and innovation [34,35], and explore new business opportunities [36]. Thus, strategic flexibility is expected to be beneficial to firm performance. This is also confirmed in virtually all the main empirical studies [10,14,37,38] and indicated by many other sources [34,39–41]. From the aspects of response flexibility and prevention flexibility, Ranjan [42] provided evidence that strategic flexibility positively affected organizational performance. Similarly, Lee [16] supported the positive effect of strategic flexibility on organizational performance. Abbott and

Banerji [17] demonstrated that strategic flexibility had a strong positive effect on organizational performance. Ahmadi and Osman [21] provided evidence that flexibility consisting of both action and resource-reconfiguring flexibility positively affected the performance of small and medium enterprises (SMEs).

Based on the above theoretical analysis, we hypothesized the following:

Hypothesis 1 (H1). *Strategic flexibility has a positive effect on organizational performance.*

2.2. Mediating Effect of Organizational Technological Configuration Capabilities

As mentioned above, strategic flexibility refers to “the degree to which a firm is willing to change its strategy in response to opportunities, threats, and changes in the external environment” [43] from the dynamic capability perspective. Considerable theoretical and empirical evidence supports the contention that strategic flexibility enhances firm performance [15,30,33]. However, other studies indicated that strategic flexibility also involves certain disadvantages [14,44] because the use of strategic flexibility may lead to high costs, increased stress, and the potential lack of strategic focus [45], which are harmful to organizational performance. Therefore, investigating the mediating mechanism of strategic flexibility that helps firms to cope with complex and dynamic environments to improve organizational performance is necessary [46].

Based on the resource management model, possessing resources and capabilities do not guarantee the development of competitive advantages to improve organizational performance. Technological capability configurations are required to help high-tech firms achieve a long-term competitive advantage [47,48]. Technological configuration capability refers to the ability to grab new market opportunities to deploy or combine organizational technological asset structures by integrating internal and external technological resources [26] and by building technological and marketing flexibility [49–52].

Although “it is easy to concentrate on flexibility’s role in handling uncertainties” at the strategic level, firms often experience difficulties designing specific methods and developing concrete configuration capabilities to attain efficiency-oriented performance objectives at the operational level [25,28]. Especially for high-tech firms, their core technology capability is rigid. If a firm overemphasizes one kind of capability that is strategically different from its competitors, it may become reluctant to adapt to changes in the environment, even if they maintain focus on strategic flexibility [53,54].

The changes and innovations in technology provide strong leverage for creating competitive advantages, and corporations need technological innovation to improve competitiveness for survival and development. This is especially evident in high-tech companies with scientific technology at their core. Simultaneously, the acceleration of technological changes will create more opportunities and threats. When a firm overemphasizes its strong technological capability, it may produce a new product or service that is consistent with past organizational routines or technological trajectories, and thus fail to satisfy consumers’ evolving needs [7,55].

Technological configuration capability leads high-tech firms to achieve adaption to market information, to respond to the voice of the customer, to solve problems jointly with customers, and to establish bonds with suppliers [56], which affect the firm when its customers’ needs change. Enterprises with high technological configuration capability should be able to adapt to unexpected changes in a timely manner during project execution, including calling for a different scope and volume of products or services that guarantee the realization of strategic flexibility at the operational level in order to gradually improve organizational performance [57].

Based on the above theoretical analysis, we proposed that:

Hypothesis 2 (H2). *Technological configuration capabilities play the role of the mediator between strategic flexibility and organizational competitive performance.*

2.3. Moderating Effect of the 'Complex-Dynamic Environment' Matrix

As an emerging country, China's external resource base is low [31]. Strategic flexibility, as a dynamic capability, significantly contributes to a firm's performance by allowing the implementation of deliberate changes, enabling the firm to adjust to a turbulent environment [32]. However, a few empirical studies documented mixed results concerning the relationship between strategic flexibility and firm performance [12]. Therefore, the influence of strategic flexibility on organizational performance is contextual [58].

The call for flexibility research to enhance the predictive powers of theories has received a response by considering the influence of environmental contexts [59]. Given the practical background of increasingly fierce global competition, rapid progress in technology, and rising customer expectations, a knowledge-intensive, complex, and uncertain environment has been created [60]. The lifespan of the corporate environment is usually vague and inexplicit, and "the only thing constant is constant change" [61]. Among all the environmental types, a turbulent environment, which refers to the rate and unpredictability of changes in a firm's external environment, best reflects the current market, especially the high-tech market [62,63]. In a turbulent environment, organizations, especially in the high-tech market, need to adjust existing operating activities or strategic orientation continually according to dynamic changes in environment in order to better cope with the challenges created by fluctuating demands and technological innovation.

Turbulent environments include two dimensions: dynamism of environment, which means that uncertainty and unpredictable behaviors of competitors and customers cause changes and updates in the organizational environment [64,65]; and complexity of environment, which is the diversification of the factors in the organizational environment and the complexity of the relationship in between these factors [64,66]. Accordingly, the environment can be categorized as a simple environment or a complex environment. Therefore, the complex-dynamic environment matrix is composed of four quadrants: simple-dynamic, simple-static, complex-dynamic, and complex-static (Figure 1). Previous empirical studies investigated the moderating effects of a turbulent environment on the relationship between strategic flexibility and organizational performance [67–69]. However, we lack a good understanding of how the two dimensions of turbulent environments might differ in their effects, depending on the stages of a product and technology.

This paper was inspired by the product life cycle (PLC) theory of Vernon (1966). The process of innovation and the spread of any new product or technology is divided into four stages: initial, growth, mature, and decline, all of which present an "S" curve (Figure 1). As for knowledge-intensive organizations, the balance between technology and market is an issue of developing the core competence of an organization. Whether an organization can grasp the characteristics of the external market on different stages of the technological life cycle, and whether an organization can become involved in the initial stage of new technology and withdraw in the decline stage of the new technology, both test technological configuration abilities. Therefore, this is becoming crucial for decision making for the success of organizations.

2.3.1. Initial Technological Stage: Dynamic-Simple Environment

In the technological initial stage, organizations are facing a dynamic-simple external environment. First of all, in the early stage, the usage of any new technology is not easily identified. In other words, there is no way to ensure that those inventors can convert new technologies to mature products. Specifically, future market demand is difficult to predict, the feasibility and economic benefits of the technological scheme are highly uncertain, and various technological schemes coexist due to the lack of uniform standards. Innovators must compare the advantages and disadvantages of various schemes to reduce the risks of failure as much as possible (Yang and Feng, 2003). Since the new technology is not yet formed, only a few corporations are involved in these industrial standards and technological schemes. The majority of the schemes remain in the research and development and laboratory phases. Therefore, few competitive factors are found in the external environment; some of the elements of

competition are similar (Hall and Khan, 2002). Since the market demand is not fully defined, whether it is superior to competitors in technology commercialization and with successful access to the consumer market is what considerably determines organizational performance as a successful competitor creates higher requirements for the combination of internal and external technologies. Hence, we proposed:

Hypothesis 3 (H3). *In the dynamic-simple external environment, the technological configuration capability will enhance organizational performance.*

2.3.2. Technology Growth Stage: Dynamic-Complex Environment

During the technological growth stage, corporations are faced with a dynamic-complex external environment. The growth and development of new technologies greatly affect the products and production process of mature industries. New technological standards gradually penetrate into the market, whereas outmoded technological standards have not yet withdrawn from the market competition stage. Both sides are locked in a seesaw struggling stage to seize market share and encourage market demand, again creating uncertainty for those who have already entered the mature industry [70]. At this point, the market demand uncertainty cannot be predicted, and corporations with long-term market insight enter into the emerging market. The competing factors increase, and new technical standards are not similar to the old standards. However, the basic elements of competition remain the same. The market enters a highly uncertain and highly competitive stage. Therefore, the dynamic-complex external environment requires corporations to adapt to the complexity and dynamics of the market correctly and quickly, in addition to rapidly communicating information and technology.

Only by converting the latest technology available in the laboratory into the products available for the market demand, or by creating products required by the market, can a corporation win in the fierce competition in the market [71]. Therefore, the technological configuration capability becomes particularly important, which may cause the evolution of industrial organizations, break the original industrial pattern of competition, and lead to the rapid growth of an industry, resulting in high business and financial values for a corporation. Hence, we proposed:

Hypothesis 4 (H4). *In the dynamic-complex external environment, technological configuration capability enhances organizational performance.*

2.3.3. Technological Mature Stage: Static-Complex Environment

In the mature technological stage, a corporation is faced with a static-complex external market environment. First, with the development and maturity of emerging industries, key technologies and products have unified standards, technological support is systematically integrated, and the technology and product development trends have become clearer [72]. Many standardized products are manufactured through this market mechanism in mature industries. With industrial development and the gradual standardization of products, the uncertainty of market demand relatively decreases. Secondly, the advanced technology and end product design understood by few corporations may pass the patent protection period, or be imitated and diffused by others, so the technological barrier has almost disappeared [73]. A flood of companies rushes into the market, resulting in a sharp rise in competition in the external environment, or even excessive competition, and finally the rapid aging of products and services. Therefore, during this stage, corporations need to explore new opportunities and capabilities to use existing technology to realize high-level technological innovation to mitigate the market risk caused by high competition and to avoid price wars [74]. Therefore, we proposed:

Hypothesis 5 (H5). *In the static-complex external environment, technology configuration capability has no significant effect on organizational performance.*

2.3.4. Technology Decline Stage: Static-Simple Environment

During the technology declining stage, corporations are faced with a static-simple external market environment. First, emerging technologies are already mature, leaving little space for innovation. Since the new technologies are still not ready, market uncertainty has declined and entered a relatively stable phase [73]. Secondly, a few corporations may disappear or merge with other corporations, creating an amalgamation and monopoly effect after a good market operation. In addition, as technology is still in use and not too many new companies are entering, corporations have arrived at a period where they can maintain a steady profit. In the market, the competitive factors are fewer and are similar to each other, and continuous changes are maintained. From the perspective of organizational resources, the static-simple external environment causes a sharp decrease in the market development of enterprises, and new technologies have not yet arrived. As a result, corporations place more demands on the integration of resources, technology configuration, and matching with environmental changes [75]. Only by successfully integrating the existing internal and external technologies and entering the new consumer market by applying existing technology can a corporation maintain a competitive edge and acquire rather high business and financial value to lay the capital foundation for the creation of an environment conducive for the innovation of new technology. Therefore, during this stage, corporations must promote their own technology configuration capability to combine commodities and consumer market demand efficiently, by which the risk of market shrinking along with technology decline should be avoided. Hence, we proposed:

Hypothesis 6 (H6). *In the static-simple external environment, technology configuration capability enhances organizational performance.*

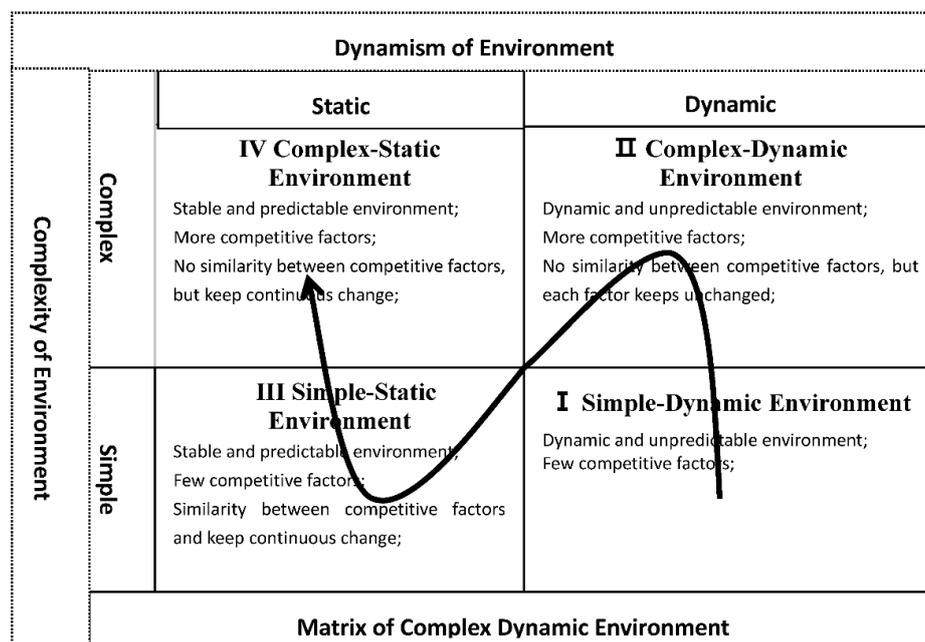


Figure 1. Matrix of the complex-dynamic environment.

3. Research Methodology

3.1. Research Sample

To test the above hypotheses, we conducted a large-scale survey of the top managers of new enterprises in hi-tech development zones in Guangdong province, Jiangsu province, Beijing, Tianjin, Shanghai, and Anhui province. The study was sponsored by a key project of the National Natural

Science Foundation of China, in which there are 300 companies in Guangdong province, 150 in Jiangsu province, 50 in Beijing, 80 in Tianjin, 50 in Shanghai, and 50 in Anhui province. A total of 680 questionnaires were distributed. Two methods were used to distribute the questionnaires. The first method was through the government high-technology zone administration committee, contacting the middle or senior leaders of high-tech organizations. Training and detailed instructions were given to the relevant officers before questionnaire distribution. The second method involved the direct contact of respondents by researchers. Respondents evaluated each index based on a Likert six-score scale according to their own real perception. To avoid common method variance, we collected data from multiple sources, and divided questionnaires into an H part and an A part. Simultaneously, to obtain valid data, we asked two individuals to separately fill in each questionnaire, meaning the H part can be filled in by the chief executive officer (CEO) and human resources (HR) director about “vicious competition”, “uncertainty of demand”, “strategic flexibility”, and “technology configuration capability”, whereas part A can be filled out by two deputy general managers (GM) about “organizational performance”. A total of 581 valid questionnaires were collected in this nationwide survey, with an 85% rate of valid collection. Non-valid questionnaires were those received from corporations in non-hi-tech industries and those that did not meet the requirements, meaning those in which the same 10 options were continually chosen or in which too many answers were left blank. After removing the non-valid questionnaires, the total number of valid questionnaires from high-tech industries was 439. Table 1 describes some basic information about the respondents and the enterprises of the respondents.

Table 1. Basic information about respondents and the enterprises surveyed.

Corporation Type	No. of Samples		Respondents (H Questionnaire)	Respondents (A Questionnaire)
State-Owned	42		General manager (GM)/Human resources (HR) director	Deputy GM
Sino-Foreign Joint Venture	49	Age		
Wholly Foreign-owned	92	≤30	134	134
Private	174	31–40	282	374
Collective	13	41–50	265	225
Others	36	≥51	82	52
Missing Value	33	Sex		
No. of Employees		Male	557	568
<100	85	Female	204	215
100–500	168	Education Level		
500–1000	57	Graduated from high school and below	86	111
1000–2000	47	College Degree	200	210
>2000	48	Undergraduate	406	413
Missing Number	34	Bachelor degree or above	64	47
Total	439	Post Tenure (Month)	53.93	55.17

3.2. Variables and Measurement

All subjects were evaluated using the Likert six-point questionnaire, with responses ranging from 1 (totally disagree) to 6 (totally agree). We adopted the single dimensional variable used by Bierly and Chakrabarti [76] and Grewal and Tansuhaj [30] to determine Strategic Flexibility. This scale includes seven items, such as “We keep adjusting strategy according the changes in the environment”, “We keep adjusting resource allocation according to the changes in the environment”, “Flexibility is the main feature of our organizational competition strategy”, etc., to which CEOs and HR Directors provided responses. The Cronbach α of strategic flexibility in this study was 0.888, the mean value was 4.46, and the variance was 0.81. For Technology Configuration Capability, we used the measuring scale introduced by Jiang [26], including three items: “We are much better than competitors in integrating internal and external technologies”, “We are much better than competitors in commercialization of

technology and successfully reaching the consumer market”, and “We are much better than competitors in applying existing technology into new market”. The Cronbach α of this scale in this study was 0.885, the mean value was 4.30, and the variance was 0.95. For Organizational Performance, the measuring scale developed by Wang et al. [77] was applied, including seven items, such as “profit level”, “general sales”, etc. The Cronbach α of this scale in this study was 0.946, the mean value was 4.30, and the variance was 0.93. For Dynamism of Environment, the scale developed by Li (2001) [78] was applied with four items, such as “Customer demand and product preferences changed quite rapidly”, “Customer tended to look for new products all the time”, “We witnessed demand for our products from customers who never bought from us before”. The Cronbach α of this scale in this study was 0.713, the mean value was 4.22, and the variance was 0.96. For Complexity of Environment, the scale of “vicious competition” developed by Li and Atuahene-Gima [78] was used with four items: “There is a lot of illegal competition in the industry”, “The market competition rules for protecting intellectual property rights of enterprises are not very effective”, and “There is a lot of unfair competition on the market, such as local protectionism”. The Cronbach α of this scale in this study was 0.754, the mean value was 3.54, and the variance was 1.10.

To control the variables, according to previous studies about performance, the nature of corporations, and organizational scale, with the number of employees as the proxy variable, on the organizational level were chosen.

4. Data Analysis and Results

4.1. Verifying Factor Analysis of Discriminant Validity in Variables

Lisrel 8.5 software was used to conduct confirmatory factor analysis. Table 1 displays the results confirming factor analysis under five conditions, in which the five-factor model fitted best ($\chi^2 = 707.99$; $df = 262$; NNFI = 0.97; CFI = 0.97; GFI = 0.89; RMSEA = 0.062). In addition to the five-factor model, we examined the other four models: a four-factor model by merging the uncertainty of the environment and complexity of the environment into one factor; a three-factor model by merging the uncertainty of the environment, the complexity of the environment, and the organizational performance into one factor; a two-factor model by merging technology configuration capability, organizational performance, uncertainty of environment, and complexity of environment into one factor; and a single-factor model by merging strategic flexibility, technology configuration capability, organizational performance, uncertainty of environment, and complexity of environment as one factor. As shown in Table 2, the fitting index supported the five-factor model, which means strategic flexibility, technology configuration capability, organizational performance, organizational performance, uncertainty of environment, and complexity of environment have good differentiated validity.

Table 2. Confirmatory factor analysis of discriminant validity of concepts.

Model	χ^2	df	NNFI	CFI	GFI	RMSEA
Five-factor model: SF, TCC, CP, EU, and EC	707.99	262	0.97	0.97	0.89	0.062
Four-factor model: SF, TCC, CP, and EU + EC	979.15	266	0.95	0.96	0.85	0.078
Three-factor model: SF, TCC, and CP + EU + EC	2419.97	269	0.85	0.86	0.69	0.14
Two-factor model: SF, and TCC + CP + EU + EC	4195.67	271	0.79	0.81	0.57	0.18
One-factor model: CB + CI + CSE + RP + EM	6537.95	272	0.68	0.71	0.46	0.23

Note: SF = strategic flexibility; TCC = Technological Configuration Capability; CP = organizational performance; EU = uncertainty of environment; EC = complexity of environment; + = merging; df = degrees of freedom; NNFI = non-normed fit index; CFI = comparative fit index; GFI = goodness-of-fit index; RMSEA = Root Mean Square Error of Approximation.

4.2. Correlation Analysis between Variables

Table 3 shows the basic descriptive statistic results for each variable. The correlation analysis results indicate that strategic flexibility is positively correlated to technology configuration capability

($r = 0.676$, $p < 0.01$) and organizational performance ($r = 0.152$, $p < 0.01$). Technology configuration capability is positively related to organizational performance ($r = 0.177$, $p < 0.01$). Dynamism of environment is positively related to organizational performance ($r = 0.099$, $p < 0.05$), whereas the correlation between organizational performance and complexity of environment was not so significant. Table 2 indicates the mean values, standard deviation, and correlation coefficient of various factors, such as strategic flexibility, technology configuration capability, organizational performance, dynamism of environment, and complexity of environment. The reliability coefficients of each construct are shown on the diagonal.

Table 3. Descriptive statistics and correlation analysis of variables ($N = 493$).

Variable	Mean Value	Standard Deviation	1	2	3	4	5
Strategic Flexibility	4.46	0.807	(0.885)				
Technology Configuration Capability	4.30	0.953	0.676 **	(0.885)			
Organizational Performance	4.30	0.927	0.152 **	0.177 **	(0.946)		
Dynamism of Environment	4.18	0.878	0.528 **	0.478 **	0.099 *	(0.713)	
Complexity of Environment	3.54	1.104	0.234 **	0.265 **	0.027	0.341 **	(0.754)

Note: * $p < 0.05$, ** $p < 0.01$. The coefficient of internal consistency of related variables is shown on the diagonal (α coefficient).

4.3. Mediating Effects of Technology Deployment Capability

H2 tested the mediating effect of technology configuration capability on the relationship between strategic flexibility and organizational performance. Based on the test by Baron and Kenny, a mediating effect has four conditions: (1) strategic flexibility must be positively correlated with technology configuration capability; (2) strategic flexibility is significantly and positively related with organizational performance; (3) technology configuration capability is significantly correlated with organizational performance; and (4) when technology configuration capability is placed into a relationship analysis between strategic flexibility and organizational performance, technology configuration capability is the full mediator if strategic flexibility is not significantly related to organizational performance. Technology configuration capability is a partial mediator if the relationship between strategic flexibility and organizational performance is weakened significantly when technology configuration capability is placed into this relationship.

According to the study by Hu and Bentler [79], we chose to report on five representative model-fitting parameters: χ^2 (root), NNFI, CFI, GFI, and RMSEA. These five fitting parameters provide fitting degree parameters between data models and a hypothetical model according to different logics. The five parameters can evaluate the fitting relationship between data and hypotheses using a comprehensive method. Based on the recommendations by Hu and Bentler [79], if NNFI, CFI, and GFI are above 0.9, the model fits well. If RMSEA is below 0.1, the model fits well, and if, χ^2/df is less than five, then the model fits well.

Table 4 provides a structural model with six nested models, M1–M6. M3, M4, M5, and M6 are significantly different from M1 and M2. M3 and M4 illustrate that technology configuration capability is not the mediator between strategic flexibility and organizational performance. M5 and M6 show that technology configuration capability are the full mediator and partial mediator between strategic flexibility and organizational performance, respectively. M1 and M2 describe the path relationship between strategic flexibility and organizational performance, and the relationship between strategic flexibility and technology configuration capability, respectively. Each fitting index in M1 shows the good fit of the model, whose path coefficient is 0.63 ($t = 10.83$; $p < 0.01$). Hence, H1 is supported. From χ^2/df and the fitting index, at the same degree of freedom, the chi-square value of M5 was the lowest. Therefore, M5 is obviously superior to M3 and M4. The $\Delta\chi^2$ between M6 and M5 was 0.35 with no significant difference.

For the models with no significant difference, we preferred to use a simple model. Therefore, the full mediating model fits better in M5, and the hypothesis about the mediator of technology

configuration capability between strategic flexibility and organizational performance in H2 is supported by the data.

Table 4. Comparison among structural models.

Model	χ^2	df	χ^2/df	NNFI	CFI	GFI	RMSEA
M1: SF→TCC	122.33	33	3.70	0.97	0.98	0.95	0.079
M2: SF→CP	258.94	75	3.45	0.97	0.98	0.92	0.075
M3: SF→CP; TCC→CP	521.66	116	4.49	0.95	0.96	0.88	0.089
M4: SF→TCC; SF→CP	327.36	116	2.82	0.98	0.98	0.92	0.064
M5: SF→TCC; TCC→CP	325.92	116	2.80	0.98	0.98	0.92	0.064
M6: SF→CP; TCC; TCC→CP	325.57	115	2.83	0.98	0.98	0.92	0.065

Note: $\Delta\chi^2$ is the difference between the chi squares of this model and the theoretical model.

Figure 2 shows the standardized coefficients among each variable. Strategic flexibility has a significant effect on technology configuration capability ($\beta = 0.76; p < 0.01$). Simultaneously, technology configuration capability has a significant effect on organizational performance ($\beta = 0.17; p < 0.01$).

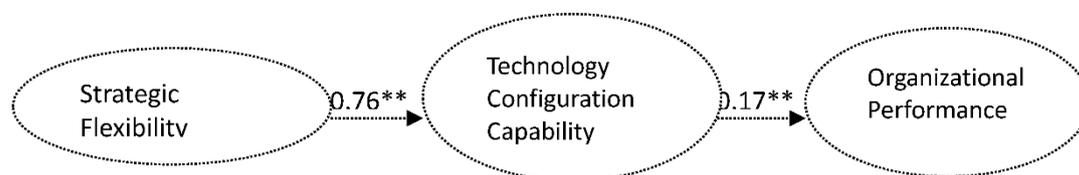


Figure 2. Full mediation model of strategic flexibility and organizational performance. Note: ** $p < 0.01$.

4.4. Effect of Complexity and Dynamism of Environment

This study also applied the combined cluster analysis and regression analysis methods, and considered the effects of complexity and dynamism of the environment on the relationship between technology configuration and organizational performance. First, we conducted K-means cluster analysis based on the mean values of the complexity and the dynamism of the environment, which was completed in three steps: (1) hierarchical cluster analysis of samples; (2) analysis and calculation of the next primary center needed by K-means cluster through mean values comparison; and (3) confirmation of the various combinations of “High-high”, “High-low”, “Low-high”, and “Low-low” complexity and dynamism of the environment (Figure 3).

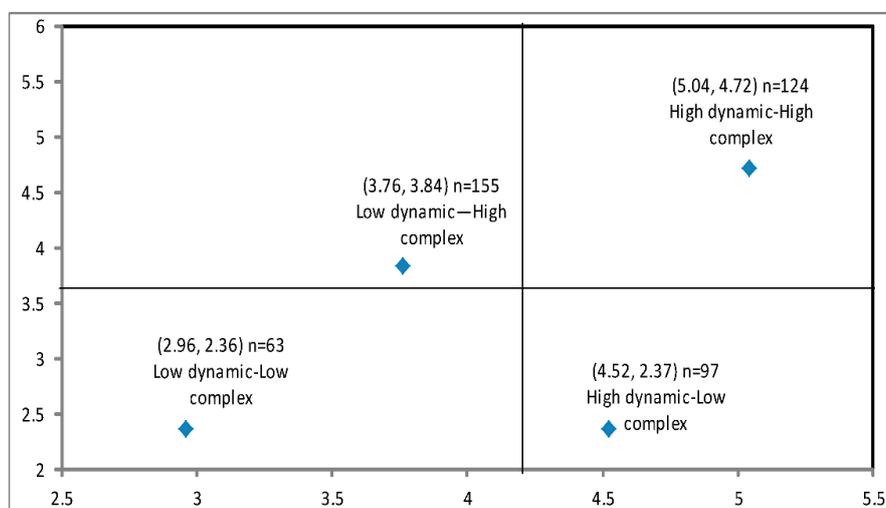


Figure 3. Four-quadrant model of the complexity-dynamism of the environment.

From Figure 3, the mean value dividing the four quadrants is 4.17, and so accordingly we categorized the levels of dynamism and complexity faced by the 439 responding corporations. Based on the four conditions, the regression model of the relationship between technology configuration capability and organizational performance was analyzed (Table 5).

Table 5. Relationship between technology configuration capability and organizational performance in different environments.

	Highly Dynamic– Low Complexity	Low Dynamic– High Complexity	Low Dynamic– Low Complexity	Highly Dynamic– High Complexity
Technology Configuration Capability and Organizational Performance	M1	M2	M3	M4
Standardized regression coefficient	0.197 *	1.412 (NS)	0.322 **	0.195 *
Sig	0.05	0.16	0.01	0.034
R ²	0.039	0.006	0.088	0.038
F value	3.74	1.994	6.692	4.614

Note: * $p < 0.05$, ** $p < 0.01$. NS is non-significant.

From Table 5, in the low dynamic–low complexity environment, the relationship between technology configuration capability and organizational performance was very significant ($r = 0.322$; $p < 0.01$), whereas in the low dynamic–high complexity environment, the relationship was insignificant ($r = 1.412$, NS), and in the highly dynamic–low complexity and highly dynamic–high complexity environments, the relationship between technology configuration capability and organizational performance was significant at the level of $r = 0.05$.

5. Conclusions and Discussion

In this paper, we examined the effects of strategic flexibility on organizational performance. We found that technological configuration capability enhances the positive relationship between strategic flexibility and an organization's performance, but the mediating effect is different under different external environments based on the dynamic analytic framework of the technological life cycle. Our findings contribute to the dynamic resource-based view of the firm [80–83]. Specifically, our empirical results suggest that the technological configuration capabilities close the gap between a dynamic capability, i.e., strategic flexibility, and organizational performance. As Helfat and Peteraf [80] argued, “dynamic capabilities do not directly affect output for the firm in which they reside, but indirectly contribute to the output of the firm through an impact on operational capabilities” [25].

Our findings provide a more nuanced understanding of the curvilinear effects of strategic flexibility on organizational performance. Previous literature highlighted the role of strategic flexibility in performance improvement, in that strategic flexibility emphasizes the flexible use of resources and the reconfiguration of processes, and reflects one type of dynamic capability that enables firms to achieve a competitive advantage in turbulent markets [2,4]. Consistent with this logic, we found that technological configuration capability enhances a firm's dynamic use of its existing knowledge and expertise in production innovation. Therefore, firms with considerable technological configuration capability are more likely to search beyond the domain of their neighborhood knowledge and embark on a broader level of exploration that transcends existing technological and organizational boundaries [7]. However, overemphasizing strategic flexibility can also lead to inferior returns on investments by pursuing future opportunities at the cost of current operations [59,84–86]. Hence, Eisenhardt et al. [87] explained that apart from strategic flexibility, firms also “need to be [operationally] efficient to gain traction, create direction, and avoid mistakes.” Our findings showed that, by combining technological configuration abilities, strategic flexibility is associated with a sustainable competitive advantage and organizational performance.

Even more novel is our finding that strategic flexibility has an inverted S-shaped relationship with performance in different external turbulent environments (Figure 1). During the three stages in high-tech enterprises: the initial, growth, and declining stages, technology allocation ability enhances the positive relationship between strategic flexibility and corporate performance, whereas in the mature technology stage, this mediating effect is not obvious (Table 6).

Table 6. Features of strategic flexibility levels in the complex-dynamic environment matrix.

TLC	EEF	SF Level	TCC	Cor. Type	OF
Initial	Dynamic unpredictable; Few competitive factors	Free action	Yes	Laboratory	Small market share, strong technological innovation power, and obscure brand advantage.
Growth	Dynamic unpredictable; More competitive factors	Challenge any time	Yes	Bellwether	Grab market share, strong technological innovation power, and obvious brand advantage
Mature	Static predictable; Competitive factors	Relatively stable	No	Monopoly	Large market share, weak technological innovation power, and obvious brand advantage.
Declining	Static predictable; Few competitive factors	Re-orientation	Yes	Imitative	Small market share, weak technological innovation power, and obscure brand advantage.

Note: TLC denotes technological life cycle; EEF denotes external environment feature; SF level denotes strategic flexibility level; TCC denotes technological configuration capability; Cor. Type denotes corporation type; and OF denotes organizational feature.

In other words, we propose that strategic flexibility, as an organizing strategic principal, may not directly affect performance; rather, it must work together with dynamic operational management (e.g., technological configuration capability) leading to quality organizational performance, especially for high-tech firms. These findings enrich the existing literature by clarifying the mixed results about strategic flexibility and performance due to the changing technological configuration capability in different external environments. These findings not only reconcile the conflicting views about the relationship between flexibility and competitive advantage [88], but also add significantly to existing anecdotal evidence that indicate the risk factors in the different stages of technology-leading firms in the face of rapid environment changes [89,90].

Our findings also provide some important managerial implications for strategic managers. As shown in Table 6, from the longitudinal study of the time dimension on different technological life stages, knowledge-intensive organizations and managers are faced with various external environmental features, which create different requirements for organizational technology configuration capabilities. The process and intensity vary too. Through anatomizing external environmental features of the technological life cycle, more scientific and distinct explanations and understanding of the relationship among environments, strategic flexibility level, and organizational performance are acquired.

First, knowledge-intensive organizations should make a decision about the development stage of the new technology, in order to more accurately grasp the external environmental features. The competitive external environment usually fluctuates, especially for knowledge-intensive organizations, requiring them to handle attacks from the competition strategy and behavior adjustment of competitors, uncertain customer-preference development, pressure from both supply and demand sides, as well as other single managerial competitive factors and compound technological competitive factors. The complexity and dynamism of the environment lead to a non-linear relationship between competitive factors and cause and effect. Therefore, for knowledge-intensive organizations, directly identifying the key factors influencing organizational success and failure from a complex competitive environmental system is rather difficult. Organizations must have the ability to monitor and analyze each stage in the technological life cycle in real time to obtain any subtle change information in the competitive

environment so they can judge the possible effect on corporations and develop buffer strategies in a timely manner.

Second, knowledge-intensive organizations should move their focus from owning technology to using technology. With the coming of the new economic era, global competition is becoming increasingly fierce. The complex and dynamic external environment has placed massive pressure on organizations to compete and survive. China's new technology-based enterprises have been focusing on introduction and have trifled with absorption, causing no synchronous increase in innovation ability, and demonstrating slow scale expansion. Thus, technological innovation cannot reach the consumer market quickly and transform the innovation into a competitive advantage and core organizational competence. Inspired by resource-based theory, knowledge-intensive organizations should focus on their own technological assets, which are technological resources owned by organizations, and emphasize technology configuration capabilities, meaning how the technological resources are used, which is crucial to promote organizational strategic flexibility, improve organizational performance, and create and maintain a competitive advantage.

Last, knowledge-intensive organizations should move from a static orientation to a dynamic orientation, promoting organizational strategic flexibility during different technological life cycle stages. Strategic flexibility involves flexibility and adaptability to reduce environmental threats, to respond quickly, and actively use external resources. As organizations' internal environments, external environments, and the interaction between them, are becoming more dynamic and complex, it is critical for organizations to cultivate and update all flexible strategic elements needed for current and future competition based on reality, and enhance their adaptability to the complex dynamic environment by promoting strategic flexibility. In a complex and dynamic competitive environment, surpassing core competencies in the long term is challenging for organizations because the competitive advantages cultivated by relying on resources and strengths are often easily replaced by new technology and product innovation. Although organizations cultivate core competency based on dynamic flexibility in order to respond to changes in the environment and adjust organizational resources allocation to adapt to the requirements of a complex and dynamic environment, they should consider the differences in the organizational life cycle stage, whether in the initial, growth, mature, or declining stage. Organizations should "change to change" according to the changes in their own situations and external environments.

6. Limitation and Directions for Further Research

This study does have some limitations. First, the samples were not acquired by probability sampling, but by choosing high-tech enterprises in the hi-tech development zones in Guangdong province, Jiangsu province, Beijing, Tianjin, Shanghai, and Anhui province. This may limit the research conclusion from being generalized for all high-tech enterprises in China. Future studies can sample high-tech enterprises from a wider range of cities, provinces, and in non hi-tech development zones. Secondly, matrixing the external environments from two variables, demand uncertainty and vicious competition, is too simple, although we tried to start from the technological life cycle and the dynamic analysis of the external environment, and discovered that organizational technology configuration capability is a dynamic process instead of a static resource. Future research should focus on the external environmental features reflecting the level of strategic flexibility, and examine how to make full use of resource flexibility and coordination flexibility to obtain strategic advantages in a global market with fierce competition.

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