

Integrative Capability, Product Innovation, and the Moderating Role of Proactiveness and Technological Environment

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Abstract—Integrative capability refers to a firm's ability to purposefully acquire, combine and deploy resources that are available in business partnerships for achieving managerial visions. Research has yet to explore the benefits of integration in partnerships for different types of product innovation despite the increasingly importance of inter-firm relationships for technology transfer and product innovation. This study proposes that integrative capability has curvilinear and differential effects on explorative and exploitative innovation. Based on multi-sourced survey data from 212 Chinese firms, the findings support the proposition that integrative capability has a positive linear effect on exploitative innovation, but an inverted U-shaped relationship with exploration. That is, a high level of integrative capability impedes explorative innovation. The findings also indicate that proactiveness strategy moderates the integrative capability and exploration relationship, mitigating the decline in exploration at a higher level of integrative capability. In addition, under the unique context of emerging economies, technological turbulence enhances the benefits of partnership integration on both explorative and exploitative innovation.

I. INTRODUCTION

Global competition and technological revolution in the competitive landscape have made it difficult for firms to rely solely on resources and capabilities of itself. Rather, it is the inter-firm collaboration that has become a critical driver of a firm's innovation and superior long-term performance [13, 35, 40, 51]. One important reason is that firms increasingly rely on inter-firm partnerships to access valuable resources and knowledge not available internally, consequently aid knowledge transfer and enhance capability building [31]. This requires firms to develop specific processes (i.e. integrative capability) to purposefully and constantly transfer resources into idiosyncratic combinations that address current competition needs and foster product innovation.

While many studies in the field of business partnerships emphasize the importance of learning and relational capital on creating competitive advantage, there is limited focus on the actual processes through which resources and capabilities may be transferred and integrated [17]. Based on dynamic capability view, integrative capability has been considered as an essential dynamic capability [42], and is defined as a firm's competence to strategically acquire, combine and deploy resources that are available in business partnerships in order to achieve managerial visions [19]. Dynamic capability view suggests dynamic capabilities lie at the core of organizational success and failure, and thus contribute to sustainable competitive advantage particularly in rapidly changing environments. However, most studies in dynamic capability literature remain theoretical and conceptual [2]. As a result,

discussion of the role of dynamic capabilities and how they influence firm performance remain underdeveloped. Particularly, the relationship between integrative capability and different type of product innovation (i.e. exploitation and exploration) remains unclear despite the strategic importance of product innovation for firm survival and growth.

Aiming to fill these research gaps, the purpose of the present study is to critically examine the nature of the effects of integrative capability on exploitative and explorative product innovation, on the contingency of a firm's strategic posture (i.e. proactiveness) and external market environment condition (i.e. technological turbulence). A survey research was conducted for 212 Chinese manufacturing firms and the findings indicate that integrative capability has differential relationships with exploitation and exploration; in addition, a firm's proactiveness and technological turbulence are important factors that moderate the benefits of integrative capability on both exploitation and exploration product innovation.

II. THEORY AND HYPOTHESES

A. Dynamic capability view of product innovation

Innovation is critical for firms to adapt to turbulent environments and achieve a sustainable competitive advantage. Various theories have attempted to disentangle the drivers of innovation, of which the dynamic capability view is one of the most influential [12, 43]. Dynamic capability view is an extension of resource-based view, which explicate how firms, as bundles of heterogeneous resources that are valuable, rare, inimitable and non-substitutable, achieve sustainable competitive advantage [5]. It is difficult for firms to maintain competitive advantage in dynamic environment, therefore firms need dynamic capabilities that enable them to create, extend and modify the ways they earn their living. As Helfat et al. [17] propose, dynamic capabilities are the capacities that firms use to purposefully create, modify and re-combine their resource base in response to external market dynamics. By adapting and refreshing resource bases, dynamic capabilities help firms avoid turning resources into core rigidities that inhibit development and result in innovation inertia [22].

B. Integrative capability in inter-firm relationships

Prior literature consider integrative capability as one important dynamic capabilities [43]. Integrative capability is defined as a firm's competence to strategically acquire, combine and deploy resources that are available in business partnerships in order to achieve managerial visions. Integration is conceptualized as a 'process of achieving unity

of effort'[21].Hence, the main function of integrative capability is to help achieve positive interaction among different resources by transforming them into comprehensive sets of value-creating organizational skills that aligning with external environment [48].

By effectively deploy integrative capability, a firm can initiate projects that it could not have successfully done alone, such as pursuing new markets or adopting new technologies. The collective rent generated from integration should be greater than the sum generated by individual firm, as firms are able to more effectively coordinate the use of interdependent resources [11, 32], and the new combination of interdependent resources are more difficult for rivals to imitate and thus more valuable in achieving competitive advantage [18].

In extant literature, integrative capability is dichotomized into internal (within firms) or external (among firms)oriented[49]. Due to our research focus on inter-firm relationships, we adopt the concept of external oriented integration that refers to the development of first-hand knowledge of external resources through information gathering, generation of integration options and evaluation of those options in line with existing resources base [49].

In line with this definition, we consider integrative capability as a dynamic capability that contains processes to achieve effective and efficient resource integration and routine integration between partnering firms in inter-firm relationships, as well as the ability to adapt these processes to environmental change. Specifically, resource integration refers to a firm's ability to identify, select complementary resources and invest them for further refinement and development in business partnerships[19].By supplying distinct resources and knowledge and strategically integrating resources, firms in a partnership are able to eliminate deficiencies in each other's resource portfolios, enhance their core competences and the ability to seize new market opportunities [20, 24].

Routine integration refers to a firm's ability to establish and manage processes and approaches to align inter-firm information sharing, cooperative routines, and joint activities into continuous sequences of daily business operations. As described by Nelson & Winter [33], routines capture the standard procedures firms use to conduct their daily activities. Such routines develop in ways that make them consistent and interdependent, generally changing slowly over time unless confronted with an external stimulus, such as a directive to replicate and innovate the routine. The implementation of inter-firm cooperation requires knowledge transfer within the combined firm, which is facilitated by the degree the two partnering firms are compatible in their routines [36].Particularly tacit knowledge that more centrally relate to firm performance outcomes than explicit knowledge, itself may be intangible, unobserved and resides in firm-specific routines[37, 38]. Unless specific routines are established and integrated between firms, tacit and complex knowledge and resources are hard to mobilize. Hence, integrative routines in inter-firm partnerships can be conceived of as a web of

coordinating relationships connecting specific resources and knowledge, which, in operation, produces innovative resource combinations and sophisticated customer solutions that neither of the partnering firms are able to achieve by its own.

C. Integrative capability and exploitation

Integration is the critical mechanism that transfers the value of useful knowledge and resources into a firm's competitive advantage. Integration in partnerships acts as an efficient mechanism to combine any related resources and capabilities of partners and reconfigure them into a more effective combination that addresses market changes. This efficient utilization may result in economies of scale and scope, and synergies among complementary resources[36]. We suggest that integrative capability facilitates exploitative innovation in inter-firm partnerships based on the following reasons. First, the accumulation of knowledge and expertise via integrative capability enables a firm to better understand and recognize the value of its resources in the existing trajectory, which in turn provides insights into how to exploit current knowledge and skills [52]. Second, applying similar knowledge in existing domains to refine a product is consistent with current firm processes and routines[46]. Accordingly, a high level of integrative capability should facilitate greater exploitation of existing know-how in partnerships. Third, firms with a superior capability in a particular field are more likely to search for local, similar information and elicit their existing knowledge to achieve immediate advantage, which creates organizational inertia [23]. The pressure of such inertia intensifies as a firm accumulates extensive resources and forms its unique processes and routines. Thus, strong integrative capability might increase the inertia pressure and encourage the firm to engage in search activities that improve efficiency and product reliable outcome in innovation [33]. Therefore,
Hypothesis 1: Integrative capability has a positive relationship with exploitative product innovation.

D. Integrative capability and exploration

When a firm builds its integrative capability, it invests substantial resources in establishing processes with partnering firms for discovering and transferring complementary resources, developing new combination of existing resources, and new ways of resource deployment (i.e. new capabilities). The accumulation of valuable resources increases the firm's ability to evaluate and use new knowledge and skills in product innovation. As a result, the firm becomes more capable to identify new technological trends, experiment with emerging technology, and engage in product innovations beyond the current technological boundaries [52]. Therefore, the higher the level of integrative capability, the more likely the firm is able to engage in explorative product innovations.

However, we posit that the positive effect of integrative capability on exploration may decline after it reaches a high level. First, integration of new knowledge is increasing costly. Integrating new knowledge into an existing one is even more

difficult for a firm that already has substantial resource base. The costs associated with learning new knowledge and restructuring existing know-how discourage resource-abundant firms to continue explorative behaviors [23]. Second, as partnering firms become more emphasize integration and compatibility in cooperative activities, it is more likely that firms will modify or even eliminate dissimilar resources and routines to maximize partnership outcomes [30, 44]. Accordingly, high integration might lead to missed opportunities due to the limitation firm experiences with less knowledge diversity to value all possible discoveries. Third, organizational inertia strongly discourages explorative innovations in firms with well-established resource base. Applying new knowledge to commercial ends becomes more challenging for firms with strong integrative capability that produces performance outcome of high efficiency and cost reduction. Because of the substantial investment in existing knowledge and the high risk associated with new innovation domain, the returns from exploration are far less certain and more distant in time compared to the returns from exploitation [27]. Therefore, we expect that the level of exploration decreases when a firm reach a certain level of integrative capability.

Hypothesis 2: Integrative capability has an inverted U-shaped relationship with explorative product innovation.

E. Moderating role of proactiveness

To overcome organizational inertia, entrepreneurial orientation is necessary for firms to break down the institutional routines and sustain explorative innovations. Entrepreneurial orientation captures a firm-level strategic posture toward the pursuit of new opportunities for organizational growth and renewal [7]. According to entrepreneurship literature, entrepreneurial orientation consist of three key behavioral dimensions: innovativeness, proactiveness and risk-taking. In our study, we specifically focus on proactiveness dimension, which refers to a firm's propensity to launch new products, services and technologies before their competitors [29].

We posit that proactiveness enhances the positive effect of integrative capability on exploration. That is, when proactiveness is high, strong integrative capability leads to more explorative innovations. First, firms with proactive posture are more likely to embrace the creation and pursuit of new opportunities. With greater proactiveness, firms may identify trends and opportunities to leverage their resources in advance of their competitors and to pioneer new offerings in prospective markets. As integrative capability increases, diminishing effect on exploration may be mitigated through more effective leveraging of the firm's resources toward opportunities for new entry, or more broadly the commercialization of new product-market domains [25]. Second, proactiveness motivates firm efforts to integrate existing resources into more sophisticated and value-creating resources bundles in inter-firm partnerships. With a more proactive strategic orientation, firms become more responsive

to externally acquired knowledge and have more intensified efforts to utilize new knowledge [47]. Proactive firms tend to be creative resource bundlers that seek the highest possible returns from their available resources, which is critical to enhance explorative innovation and avoid diminishing return of integrative capability. Therefore,

Hypothesis 3: Proactiveness strengthens the positive effect of integrative capability on explorative product innovation.

F. Moderating role of technological environment

Rapid and unpredictable environmental changes have led to most organizational failures because core competences easily become obsolete. Firms must possess dynamic capabilities that are concerned with organizational change, strategic renewal and adaptation, otherwise the strategic value of operational capabilities would be largely reduced if dynamic capabilities are ignored [50]. Dynamic capability view also suggests that the effect of dynamic capabilities on firm-level outcomes is essentially relevant to the business environment within which firms are embedded [42]. Dynamic capabilities are not limited to dynamic environments; they can offer value in less dynamic markets where they constitute detailed, analytical processes for incremental change [12]. Yet the value of dynamic capability should be stronger in more dynamic environments. In view of that, we expect that technological turbulence strengthens the effect of integrative capability on both exploitative and explorative product innovations.

Technological turbulence arises from changes in the underlying technologies of products or services and creates opportunities for new technologies. First, technological turbulence should increase a firm's motivation to collaborate and its dependence on inter-firm partnerships for capturing emerging market opportunities [45]. Responding to changing markets often requires more knowledge and resources than a single firm possesses. As such, high technological turbulence may lead to greater cooperation and intensive knowledge sharing in inter-firm partnerships. Second, an environment of technological turbulence is rife with possibilities and choices, but choosing among technologies is challenging because of the uncertainties and ambiguities that arise as a result of turbulence [9, 10]. The higher the rate of technological obsolescence, the more a firm relies on inter-firm alliances to develop and capture new technologies. Accordingly, the motivation of acquiring external resources and effort firms invest into commercializing such new resources are intensified, thus the value of integrative capability on innovation outcomes is enhanced. Therefore,

Hypothesis 4: Technological turbulence strengthens the positive effect of integrative capability on (a) exploitative and (b) explorative product innovation.

III. METHOD

A. Sampling and data collection

We chose manufacturing industries in China as our study

context for several reasons. First, product innovation is a critical strategy for Chinese manufacturers to move up to the global value chain, from own equipment manufacturing (OEM), original design manufacturing (ODM), to be own brand manufacturing (OBM). Second, NPD alliances are widely used by Chinese manufacturing firms to accelerate product innovation and reduce risks resulting from rapid economic development and a transitional economy. Third, China has been a popular context to examine innovation because of its dynamic market environment and growing innovation activities [4, 53].

A questionnaire survey was conducted with top managers of Chinese manufacturing firms in several industries. In the pre-test, we invited 18 senior managers to respond to the initial questionnaire and identify any ambiguities in terms, concepts, or issues. Minor modifications to the questionnaire were then made on the basis of their feedbacks. The questionnaires were originally written in English and then translated into Chinese following the commonly used translation-back translation procedure [6]. In our sampling procedure of formal survey, we used Directories of Local Enterprises Associations in the Fujian Province of China. We screened firms that had been operating less than 3 years and/or had fewer than 50 full-time employees. This is because firms that are too young and small are not likely to possess an adequate level of capabilities and alliance experience. After screening, we randomly selected firms from directories and the initial sample frame consisted of 600 manufacturing firms. Although gathering firms from a single province presents some limitations, manufacturing firms in this province are representative of China in terms of industry variety, economic growth, and scale.

We adopted a key informant approach for data collection. We made telephone calls to the general managers or chief executive officers (first respondents) of the 600 firms in our initial sample to explain the purpose of the study and invite them to participate. If they agreed to participate, we asked (1) whether their firms had established strategic alliance(s) for NPD projects, (2) such alliance is established for at least one year, and (3) such alliance produced at least one new product on the market for at least six months. Of the 600 firms, 51 did not meet the criteria, and 66 declined to participate. Therefore, we were left with 483 firms that met our qualification standards. Of the 483 firms, we asked the first respondents to identify the most important NPD alliance if more than one to answer questionnaires. We ensured the confidentiality of responses and agreed to offer a summary copy of the aggregate results and customized analyses of the firm in return for participation.

Two stages of data collection were performed in order to approach two senior managers in each firm. In the first stage of the survey, we personally distributed questionnaire surveys to the general managers or CEOs (first respondent) of the 483 firms and collected the completed questionnaires two weeks later. On the distribution of questionnaires, the respondents were again guaranteed confidentiality, to ensure the reliability of their answers. This procedure resulted in 287 completed

questionnaires, of which 271 were usable (valid response rate = 56.1%) after we eliminated responses with missing data and inadequate levels of informant confidence (less than 4 on a 7-point scale). The average confidence level of respondents was 6.11 for the first respondents. When we collected the questionnaires, we asked the first respondents to provide contact information of another senior executive (second respondent) who was knowledgeable about the firm's alliance and product innovation activities. These respondents included vice general managers, CEOs, and branch managers in sales and marketing. In the second stage, we distributed 271 questionnaires to the second respondents and collected 219 completed forms after two weeks. 7 questionnaires were eliminated because of missing data and inadequate level of confidence (valid response rate = 78.2%). The average confidence level of respondents was 5.97 for the second respondents. We therefore carried 212 responses, with pair responses, forward to the data analysis.

These responding firms were from various manufacturing industries including electrical machinery, communication equipment, chemical products and medical products, etc. Firm age included those are between 3-5 years (20.5%), between 6-10 years (22.4%), between 11-20 years (35.3%) and over 21 years (21.8%). For firm size, 20.0% of sampling firms had the number of employees less than 100, 16.9% had between 101-200, 16.0% had between 201-400, 17.2% had between 401-999, and 29.8% had employees more than 1000. Non-responded firms were compared with responded firms in terms of firm age, size, and industry, and no significant differences were found across these indicators. Of the respondents, 18.4% were presidents, CEOs and general managers; 73.0% were deputy general managers and branch managers; 58.8% had been in the position for over 5 years.

B. Measures

Integrative capability captures two dimensions: resource integration and routine integration. The measure of integrative capability was newly developed on the basis of prior conceptual research [20, 26, 36, 42, 49]. After modification based on feedbacks from in-depth interviews, resource integration was measured by four items and routine integration was measured by five items. To measure proactiveness, we adopted a nine-item measure from Miles & Snow (1978). To measure technological turbulence, we adopted a five-item measure from Song et al. [41]. The measures of explorative and exploitative product innovation were adopted from [4]. We also included several control variables (e.g. firm size, age etc.) that might affect the effect of integrative capability on product innovations.

IV. ANALYSES AND RESULTS

A. Construct validity

We assess construct validity in accordance with Anderson and Gerbing's [3] recommendations. First, we run exploratory factor analyses for each multi-item scale, which result in the theoretically expected factor solutions. The

reliability analyses also show that these measures possess satisfactory reliability coefficients. Second, we estimate an overall, five-factor confirmatory measurement model. The model achieves a satisfactory fit to the data ($\chi^2(443)=638.621$; GFI=0.944; TLI=0.915; CFI=0.926; RMSEA=0.056). Furthermore, all factor loadings are significant ($p < 0.001$), the composite reliabilities of all constructs exceed the 0.70 benchmark, and all average variances extracted (AVE) are greater than 0.50. These measures demonstrate adequate convergent validity and reliability [14].

We then assess the discriminant validity of the measures in two ways. First, we run chi-square difference tests for all the constructs in pairs to determine whether the restricted model (correlation fixed as 1) is significantly worse than the freely estimated model (correlation estimated freely). All the chi-square differences are highly significant, in support of discriminant validity [3]. Second, we calculate the shared variance between all possible pairs of constructs to determine if they are lower than the AVE for the individual constructs.

The results show that for each construct, the AVE is much higher than the highest shared variance with the other constructs, in additional support of discriminant validity [15]. Overall, these results show that our measures possess adequate reliability and validity. Table 1 reports the basic descriptive statistics and correlations of the measures.

B. Hypotheses testing

To test our hypotheses, we employ a stepwise hierarchical regression approach to assess the explanatory power of each set of variables. Variables used in the interaction term were centered so as to reduce multicollinearity problems [1]. The variance inflation factors were all below the suggested cut-off value of 10 [28], indicating that multicollinearity is not a significant concern. In Table 2 and 3, we present the results of the standardized regression estimates to allow for a direct comparison between coefficients with respect to their relative explanatory power of the dependent variable.

TABLE 1. CORRELATION MATRIX AND DESCRIPTIVE STATISTICS

Construct	1	2	3	4	5	6	7	8	9	10	11	12
1 Integrative capability	1											
2 Explorative product innovation	.447**	1										
3 Exploitative product innovation	.518**	.540**	1									
4 Proactiveness	.043	.137*	.062	1								
5 Technological turbulence	.167*	-.026	.078	.081	1							
6 State-owned ownership	.078	.144*	.058	.012	-.183**	1						
7 Firm size	.207**	.307**	.286**	-.022	-.026	.252**	1					
8 Firm age	.212**	.318**	.274**	-.013	.022	.195**	.649**	1				
9 Firm industry	-.132	-.126	-.050	.063	-.002	.038	-.068	.014	1			
10 Partnership length	.170*	.264**	.219**	-.035	-.012	.133	.449**	.557**	.004	1		
11 Chinese partners	-.058	-.171*	-.116	-.076	-.158*	-.003	-.267**	-.269**	-.003	-.272**	1	
12 Market turbulence	.100	.073	.130	.008	.320**	-.088	-.081	-.127	-.283**	-.111	.075	1
Mean	4.819	4.719	4.611	4.855	5.074	.120	3.420	2.680	1.800	1.750	.724	4.568
Std. Deviation	.900	1.189	1.101	1.057	1.194	.325	1.787	1.209	1.130	.798	.448	1.202

TABLE 2. STANDARDIZED REGRESSION ESTIMATES ON EXPLOITATION

	Exploitative product innovation					
	M1	M2	M3	M4	M5	M6
<i>Control variables</i>						
State-owned	-.005	-.021	-.022	-.024	-.032	-.048
Firm size	.171*	.135*	.137*	.136*	.129	.156*
Firm age	.133	.077	.077	.078	.084	.072
Firm industry	.018	.058	.055	.055	.065	.036
Partnership length	.088	.048	.050	.050	.047	.024
Chinese partners	-.013	-.021	-.016	-.017	-.029	-.023
Market turbulence	.196**	.137*	.135*	.131*	.163**	.126*
<i>Direct effects</i>						
Integrative Capability (IC)		.451***	.447***	.443***	.460***	.435***
IC ²		-.034	-.039	-.044	-.030	-.082
Proactiveness			.043	.039		
Technological turbulence					-.064	-.002
<i>Interaction effects</i>						
IC × Proactiveness				.016		
IC ² × Proactiveness				.015		
IC × Technological turbulence						.212**
IC ² × Technological turbulence						-.040
R ²	.135	.327	.328	.329	.330	.376
Adjusted R ²	.106	.296	.295	.288	.296	.338
R ² change		.191	.002	.001	.003	.047
F	4.522***	10.778***	9.730***	8.041***	9.786***	9.912***
F change		28.381***	.528	.057	.905	7.935***

*= $p < 0.05$; **= $p < 0.01$; ***= $p < 0.001$

TABLE 3. STANDARDIZED REGRESSION ESTIMATES ON EXPLORATION

	Explorative product innovation					
	M1	M2	M3	M4	M5	M6
<i>Control variables</i>						
State-owned	.083	.069	.066	.053	.041	.025
Firm size	.114	.091	.097	.109	.075	.090
Firm age	.163*	.111	.112	.118	.130	.124
Firm industry	-.093	-.052	-.063	-.055	-.035	-.044
Partnership length	.104	.050	.055	.042	.046	.036
Chinese partners	-.070	-.075	-.061	-.058	-.097	-.091
Market turbulence	.107	.057	.053	.039	.126*	.096
<i>Direct effects</i>						
Integrative Capability (IC)		.451***	.440***	.422***	.475***	.437***
IC ²		-.142**	-.156**	-.181***	-.131*	-.179**
Proactiveness			.136**	.148**		
Technological turbulence					-.166**	-.124*
<i>Interaction effects</i>						
IC × Proactiveness				-.012		
IC ² × Proactiveness				.122*		
IC × Technological turbulence						.148*
IC ² × Technological turbulence						.088
R ²	.160	.386	.403	.417	.406	.420
Adjusted R ²	.131	.358	.373	.381	.376	.385
R ² change		.226	.018	.013	.020	.014
F	5.493***	13.944***	13.455***	11.736***	13.598***	11.897***
F change		36.726***	5.950*	2.278*	6.826**	2.421*

*= $p < 0.05$; **= $p < 0.01$; ***= $p < 0.001$

With hypothesis 1, we consider the effect of integrative capability on exploitation. As it is shown in Table 2 M2, integrative capability positively affect exploitation ($b = 0.451, p < 0.001$), in support of Hypothesis 1. The square terms of integrative capability is not significantly associated with exploitation ($b = -0.034, p > 0.05$). Hypothesis 2 deals with the relationship between integrative capability and exploration. As M2 shows in Table 3, integrative capability positively relates to exploration ($b = 0.451, p < 0.001$), whereas the square terms of integrative capability negatively affects exploration ($b = -0.142, p < 0.01$). Therefore, integrative capability has an inverted U-shaped relationship with exploration, in support of Hypothesis 2.

In hypothesis 3, we assess the moderating role of proactiveness on the effects of integrative capability. As M4 shows in Table 3, the interaction between integrative capability and proactiveness is not significantly associated with exploration ($b = -0.012, p > 0.05$), but the interaction between integrative capability square and proactiveness positively affect exploration ($b = 0.122, p < 0.05$). This indicates that proactiveness strengthens the effect of integrative capability on exploration, in support of Hypothesis 3. Hypothesis 4a and 4b considers the moderating role of technological turbulence on the effects of integrative capability. As shown in Table 2 M6, the interaction between integrative capability and technological turbulence positively relates to exploitation ($b = 0.212, p < 0.01$), which indicates that technological turbulence enhances the positive effect of integrative capability on exploitation, supporting Hypothesis 4a. As shown in Table 3 M6, the interaction between integrative capability and technological turbulence positively relates to exploitation ($b = 0.148, p < 0.05$), which indicates that technological turbulence enhances the positive effect of

integrative capability on exploration, supporting Hypothesis 4b.

V. DISCUSSION

Building on the dynamic capability view, we examine the effects of integrative capability on explorative and exploitative product innovation. We find that integrative capability has a positive linear relationship with exploitative product innovation but an inverted U-shaped relationship with explorative innovation. We further find that proactiveness enhances the effect of integrative capability on exploration by mitigating its diminishing impact; and technological turbulence strengthens the positive effect of integrative capability on both exploitation and exploration. Our findings thereby contribute to existing literature in three major ways.

First, our findings provide a more comprehensive understanding of integrative capability in the context of inter-firm partnership, as well as its differential effects on exploitative and explorative product innovation. Inter-firm integration is of critical importance for partnership outcomes as value is generated only when resources and knowledge are strategically combined, manipulated and deployed rather than being merely accessed and accumulated [39]. This requires firms to develop specific processes (i.e. integrative capability) to purposefully and constantly transfer resources into idiosyncratic combinations that address current competition needs [8]. Based on the previous research, we conceptualized and empirically tested the phenomenon of integrative capability by capturing two essential dimensions: resource integration and routine integration. Such new conceptualization of integrative capability contributes the

existing literature of integration by emphasizing that superior partnership outcomes depend on not only the integration of complementary resources, but also the integration of routines and firm-specific processes in which tacit and complex knowledge resides.

More importantly, we find that integrative capability has differential effects on the two types of product innovation. On the one hand, integrative capability enhances a firm's exploitative product innovation. As a firm becomes better at integrating external resources, it likely accumulates extensive resources in a particular field/expertise, thus becomes more efficient in evaluating, assimilating and applying existing knowledge to product extensions and refinements. Firms with strong integrative capability are more likely to maximize the potential of current resources and strengthen their established competitive advantage. On the other hand, integrative capability has an inverted U-shaped relationship with explorative product innovations. That is, a moderate level of integrative capability relates to the highest degree of exploration, whereas a high level of integrative capability actually inhibits firms' exploration of new alternatives. Integrating new knowledge is increasingly costly. Firms with strong integrative capability may become so competent in searching for familiar knowledge that produce immediate outcomes; and become unwilling to migrate to new knowledge that require a different set of rules and processes and provide only distant, uncertain returns. Moreover, inter-firm integration requires relationship-specific investments which usually involve sunk costs. Such costs can be substantial when a high level of integration is reached, thus discourage firms to look for explorative opportunities and new partnerships. Therefore, rich experience and expertise in inter-firm integration may decrease a firm's intention to explore future opportunities that radically departure from existing domains.

Second, we further investigate that proactiveness represents an important means through which firms can increase the benefits of integrative capability and sustain their exploration. That is, proactiveness posture makes the positive influence of integrative capability stronger and shifts the optimal point of integrative capability for exploration from a moderate to a higher level. Therefore, proactiveness helps firms to achieve the potential of their integrative capability for exploration. By examining proactiveness as an important moderating mechanism, the present research goes beyond recent conversations concerning the relationship between entrepreneurial orientation and firm performance [34]. It is not sufficiently useful to view entrepreneurial orientation as an inherently beneficial or disruptive strategic posture; rather, a more meaningful contingency perspective on this matter concerns what entrepreneurial orientation entails may influence firm performance [47].

Third, we empirically confirm that the effect of dynamic capability on performance is contingent on external environment, consistent with dynamic capability view. Specifically, technological turbulence enhances the benefits

of integrative capability on both exploitative and explorative product innovation, since technological changes enhance a firm's motivation and dependence on external partnerships for sustaining competitive advantage.

Our findings also provide some important managerial implications. Firms reach for partnerships to gain external useful resources for continuously exploiting market opportunities, such as entering into new markets, developing new products etc.[16]. However, the high failure rates in achieving partnership objectives suggest that the process of transforming external-sourced resources into competitive advantage is indeed complex and challenging[17]. Firms must recognize the necessity of developing integrative capability in inter-firm partnerships for implementing product innovation. This includes strategically identifying and recombining useful resources to support a firm's adaptation and growth in changing market environment, as well as accommodating specific routines to facilitate intensive knowledge transfer across partnering firms. At the meantime, firms should also be aware of the limitations of integrative capability for explorative innovation. For example, firms with a strong integrative capability should understand that though their integrative competence greatly enhances product extension and refinement, it may trap them in existing trajectories, lock them in existing market domain, and prevent them from exploring new options. To overcome such challenges, firms should adopt a proactive posture in their strategic orientation. Proactiveness stimulates greater exploration of new opportunities and products, which may help firms escape the competence trap. Furthermore, in a more dynamic environment, the value of integrative capability is even more important for both exploitative and explorative innovation.

Our findings should be interpreted with some caution. First, our analysis of exploitation and exploration is limited to the domain of new product development. Further research should investigate the role of integrative capability in achieving other aspects of firm performance. Second, due to the use of Chinese manufacturing industries as study context, one should be cautious to generalize the conclusions of this study for other industry or economic contexts. Third, our study is cross-sectional, which limits the test of the causal inferences of capability and innovation. Further research should tackle the dynamics of capabilities and innovation with a longitudinal study.

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APPENDIX: MEASUREMENT ITEMS FOR KEY CONSTRUCTS

Integrative capability (1: Strongly Disagree; 7: Strongly Agree)

1. We and our partner make the best use of newly acquired resources by integrating them with existing ones
2. We create synergy among complementary resources with our partner
3. We and our partner constantly recombine existing resources in a new way to attain better operation results
4. we and our partner integrate resources that are previously unrelated to create new capabilities
5. Employees recognize and use expertise in many functional areas of our partner to meet mutual partnership objectives
6. Employees keep open communication with our partnering firms
7. Employees have regular direct, face to face contact with people in different departments with our partner
8. We agree with this partner how to handle our business dealings
9. We invest in the technology infrastructure to facilitate the communication flows with our partner
10. We emphasize the compatibility in organizational cultures and values in our partnership

Proactiveness (1: Strongly Disagree; 7: Strongly Agree)

1. We operate within a relative broad product-market domain
2. We constantly seek new opportunities related to the present operations
3. We constantly lookout for business opportunities that can be acquired in both established and new product markets
4. We are always ahead of our competitors in responding to market challenges
5. We are often the first to seize new opportunities for market growth, resulting in first-mover advantages to gain market share speedily
6. We are often the 'first in' with new products and/or services in the industry
7. We create new preferences by informing customers about new benefits of our products
8. We initiate actions to which our competitors often have to respond
9. We often try to initiate actions to create a favourable market environment

Technological Turbulence (1: Strongly Disagree; 7: Strongly Agree)

1. The technology in our industry is changing rapidly
2. Technological changes provide big opportunities in our industry
3. It is very difficult to forecast where the technology in our industry will be in the next 2 to 3 years
4. A large number of new product ideas have been made possible through technological breakthroughs in our industry
5. Technological developments in our industry are rather minor

Market Turbulence (1: Strongly Disagree; 7: Strongly Agree)

1. In our kind of business, customers' product preferences change quite a bit over time
 2. Our customers tend to look for new product all the time
 3. We are witnessing demand for our products and services from customers who never bought them before
 4. New customers tend to have product-related needs that are different from those of our existing customers
 5. We cater to many of the same customers that we used to in the past
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