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Cross-border Search, Ambidextrous Learning and Breakthrough Innovations in International New Ventures

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Abstract: To explore the impact of cross-border search and ambidextrous learning on breakthrough innovations of international new ventures, this study empirically analyzes the effect of prospective and following cross-border search on breakthrough innovations of international new ventures based on a sample of 246 international new ventures, focusing on the mediating effect of exploratory learning and exploitative learning between cross-border search and breakthrough innovations. The study finds that: both prospective and following cross-border search significantly enhance the performance of breakthrough innovations; ambidextrous learning has a positive and significant effect on breakthrough innovations, and the effect of exploitative learning is more significant; exploratory learning partially mediates the relationship between prospective cross-border search and breakthrough innovations, and fully mediates the relationship between following cross-border search and breakthrough innovations; and exploitative learning fully mediates the relationship between cross-border search and breakthrough innovations.

Keywords: Cross-border search; Exploratory learning; Exploitative learning; Breakthrough innovations; International new ventures.

1. Introduction

The deep restructuring of the global industrial chain and the penetration and integration of information technology have enabled many international new ventures to participate in international competition at an early stage of operation [1]. However, the "entrant disadvantage" and challenges such as cultural differences and technological barriers limit the market expansion and technological innovation of international new ventures [2]. Research has shown that resources such as technology and knowledge, on which the development of enterprises depends, are spreading from inside to outside, and are characterized by externalization, diversification, and fragmentation [3]. In this regard, international new ventures need to abandon the "silo" mentality, and mitigate development shortages and gain competitive advantages through cross-border search and transnational resource integration in multiple ways. However, excessive cross-border search may lead to information overload or resource fragmentation, which may affect the innovation and growth of enterprises [4]. Enterprises need to grasp the right timing for cross-border search (e.g., Prospective or following timing), and cross-border search provides enterprises with "static elements" of innovation. ambidextrous learning theory states that enterprises also need to apply knowledge to different scenarios through exploratory learning and utilization learning in order to achieve breakthrough innovations in technology, products, and markets [5].

Based on organizational search and ambidextrous learning theory, this study constructs a theoretical framework of cross-border search, ambidextrous learning and breakthrough innovation, and explores how cross-border search affects the breakthrough innovation of international new ventures through ambidextrous learning. It also tests the relevant hypotheses through empirical analysis, in the hope that the relevant research can provide a strategic basis for international new ventures to occupy a more favorable position in the global market.

2. Theoretical Foundations and Research Hypotheses

2.1. Cross-Border Search and Breakthrough Innovation of International New Ventures

Cross-border search is regarded as an important means for internationalized enterprises to carry out strategic layout and high-end factor enhancement in the global value chain [6]. Especially for international new ventures dedicated to new product development and new market development, relying only on internal resources is no longer able to meet the rapid changes in cutting-edge technology and market demand [7]. international new ventures need to flexibly apply forward search or follow search strategies according to their strategic objectives in order to gain comprehensive competitive advantages such as differentiation, low cost, and high efficiency [8]. Therefore, this study draws on the studies of Feng Xiaobin [6] and Desmond [9] to explore the different mechanisms of Prospective cross-border search and following cross-border search in the breakthrough innovation of international new ventures.

Prospective cross-border search requires enterprises to have strong market acumen and technological foresight to accurately capture heterogeneous knowledge areas that are not popular but contain great potential and value, seize the first opportunity for industry development, lead technological innovation, and realize leapfrog development [9]. Different from the Prospective cross-border search, the following cross-border search seems to be passive and conservative, but it is more robust, requiring enterprises to have the ability to

quickly respond to market changes and efficiently integrate the existing technical resources [10]. By absorbing heterogeneous knowledge to optimize the production process, improve the quality of products and services, and reduce the risk of innovation, international new ventures can ensure their competitive position in mature markets and avoid falling behind in the fierce competition [11]. In summary, this study proposes the following hypotheses:

H1a: Prospective cross-border search has a positive facilitating effect on breakthrough innovation of international new ventures.

H1b: Following cross-border search has a positive facilitating effect on breakthrough innovation of international new ventures.

2.2. Ambidextrous Learning and Breakthrough Innovation in International New Ventures'

ambidextrous learning, including exploratory and exploitative learning, is at the heart of breakthrough innovation in international new ventures. Erzurumlu's [12] study explored that high levels of exploratory and exploitative learning are key drivers of enterprises' responsiveness to customer needs and technological change. Peng Xinmin et al [13] found that the integrated use of ambidextrous learning strategies can facilitate the exploration of the frontiers of knowledge and ensure the robust advancement of the innovation process. The exploratory learning process breeds breakthroughs in existing knowledge frameworks, and once successful, the innovations it brings can often trigger profound or even disruptive changes in the entire industry [14]. However, in the complex and changing business environment, pure exploratory learning is also accompanied by high risk, in order to balance this risk, exploitative learning plays an indispensable role, exploitative learning can reduce the uncertainty and risk of exploratory learning by tapping into and utilizing past experience and feedback, as well as monitoring all aspects of the innovation, to ensure the efficiency of the organization's operations and market adaptability [13]. Based on this, this study proposes the following hypotheses:

H2a: Exploratory learning has a significant positive impact on breakthrough innovation in international new ventures.

H2b: Exploitative learning has a significant positive impact on breakthrough innovation of international new ventures.

2.3. The Mediating Effect of Ambidextrous Learning

There may be significant differences between the external novel knowledge acquired by international new ventures through cross-border search and the established internal knowledge system of the firm, which poses a challenge to its integration capability [15]. If the enterprise lacks an effective mechanism to deal with the differences, it may easily fall into "knowledge redundancy" or become "knowledge islands", which may hinder the innovation process [10]. The ambidextrous learning mechanism bridges the gap between cross-border search and breakthrough innovation of international new ventures by balancing exploratory learning and utilization learning [14]. Through ambidextrous learning, international new ventures can integrate static innovation elements from cross-border search into their internal knowledge system and transform them into endogenous motivation, which helps them to capture market opportunities and at the same time, solidify their development foundation, continuous refinement and continuous innovation. In summary, this paper proposes the following research hypotheses:

H3a: Exploratory learning mediates the relationship between Prospective cross-border search and breakthrough innovation in international new ventures.

H3b: Exploratory learning mediates the relationship between follow-through cross-border search and breakthrough innovation in international new ventures.

H4a: Exploitative learning mediates the relationship between Prospective cross-border search and international new ventures breakthrough innovation.

H4b: Exploitative learning mediates the relationship between following cross-border search and breakthrough innovation in international new ventures.

3. Research Design

3.1. Data Collection

This study collects data through questionnaire survey method. The questionnaire was designed with reference to mature scales at home and abroad, and adjusted with enterprise interviews and expert opinions. In order to obtain large-scale samples of international new ventures from different places in China, this study mainly distributes the questionnaires through three channels: firstly, it mainly selects international new ventures in eight representative regions in China, such as Beijing, Shanghai, Guangzhou, Shenzhen, etc.; secondly, it distributes the questionnaires to EMBA students of the institutions located in Shanghai, Zhejiang, Jiangsu, etc.; thirdly, it distributes the questionnaires through the online research website "Questionnaire Star". Third, through the online research website "QuestionStar".

From June to October 2024, including the small-sample pre-survey and large-sample research phase, in the large-sample research phase, the project team contacted 1,230 international new ventures, a total of 660 questionnaires were sent out, and 391 questionnaires were recovered, with a recovery rate of 59.24%, excluding 145 invalid questionnaires, and the final valid questionnaires 246 questionnaires, with a validity rate of 62.92%. In order to ensure the consistency and reliability of the samples, the project team divided the samples into two groups according to the chronological order of questionnaire collection and carried out the independent sample t-test. The test results show that there is no significant difference between the two groups of samples in terms of the two key variables of size and years of experience, indicating that the samples have good consistency and representativeness. Table 1 details the results of the descriptive statistics of the characteristics of the sample enterprises.

Table 1. Descriptive statistics of sample enterprises' characteristics (N=246)

Characteristic	Category	Number	Percentage
Enterprise scale	Fewer than 20 employees	15	6.1%
	21-50 employees	69	28.0%
	51-100 employees	73	29.7%
	101-200 employees	56	22.8%
	More than 200 employees	33	13.4%
Nature of enterprise	State-owned or state-controlled	58	23.6 %
	Private enterprise	117	47.6%
	Sino-foreign joint	38	15.4%
	Wholly Foreign-Owned	30	12.2%
	Others	3	1.2%
Enterprise age	No more than 2 years	83	33.7%
	2-5 years	40	16.3%
	6-10 years	62	25.2%
	11-15 years	50	20.3%
	More than 15 years	11	4.5%
Industries	Traditional manufacturing industries	65	26.4%
	Biomedical industry	44	17.9%
	High-tech industries	53	21.5%
	Modern service industry	48	19.5%
	Others	36	14.6%

3.2. Measurement of Variables

In order to ensure the reliability and validity of the measurement tool, this study adopts the mature scale that has been validated to have high acceptance in domestic and international literature and complete measurement items. The questionnaire includes two parts: basic information and measurement scale: the basic information mainly examines the characteristics of enterprise size, enterprise age, enterprise nature and industry, etc. The measurement scale includes a total of 19 items, all of which are designed by the Likert5 scale method. (1) Cross-border search, mainly based on the research of Feng Xiaobin [6], Desmond [9] and Wang Juanru [10], etc., respectively, designed four items to measure prospective cross-border search (PBS) and follower cross-border search (FBS). (2) ambidextrous learning, mainly drawing on the scales of Ge Baoshan [16], O'Cass [7] and Erzurumlu [12], etc., 3 question items were designed to measure exploratory learning (EXPR) and utilization learning (EXPI), respectively. (3) The measurement of breakthrough innovation (BI) mainly refers to the scales of Shao Yunfei [17] and Phene [18], etc., and designs five items to measure whether the enterprises, compared with other enterprises in the same industry, have carried out innovative activities that are a big gap from the existing technologies, products, services, markets or customers. In addition, this study also set the enterprise size and enterprise age as control variables. Among them, firm size is measured by the logarithmic value of the number of employees in the firm. The enterprise years are measured by the number of years the enterprise has been in business.

3.3. Reliability Test

In this study, SPSS20.0 and AMOS20.0 software were used to test the reliability and validity of the scale. The results show that the Cranach's alpha coefficient of all variables is more than 0.7, the KMO value is more than 0.7, the factor loading coefficients are more than 0.5, the CR value of the combined reliability is more than 0.6, and the AVE value is more than 0.5.The goodness-of-fit indexes of the five-factor model (CFI, TLI, and IFI values) are more than 0.9, and the RMSEA value is less than 0.08.In summary, the The measurement scales of the variables, passed the reliability and validity tests. Table 2 shows the descriptive statistics of the variables of interest.

Table 2. Descriptive statistics of variables with matrix of correlation coefficients (N=246)

Variable	1	2	3	4	5	6	7	8
1. Enterprise scale	1.000							
2.Enterprise age	0.550**	1.000						
3. Prospective cross-border search	-0.053	0.062	1.000					
4. Following cross-border search	-0.191	-0.030	0.568**	1.000				
5. Exploratory learning	0.047	-0.040	0.483**	0.465**	1.000			
6. Exploitative learning	0.254	0.086	0.416**	0.453**	0.740**	1.000		
7. Resource orchestration capability	0.141*	-0.060	0.361**	0.450 **	0.397**	0.394**	1.000	
8. Breakthrough Innovation	-0.024	-0.073	0.517**	0.454**	0.576**	0.558**	0.493**	1.000
Mean	2.782	3.718	3.686	3.735	3.831	3.952	3.866	3.797
SD	1.391	1.270	0.845	0.686	0.579	0.630	0.770	0.750

Note: n=246; * $p < 0.05$; ** $p < 0.01$(bilateral test)

4. Empirical Analysis

4.1. Main Effect Test

Model 1 in Table 3 shows no significant effect of control variables on breakthrough innovation of international new ventures. Model 2 shows that both Prospective cross-border search (β=0.208, P<0.05) and following cross-border search (β=0.279, P<0.05) have a significant positive effect on breakthrough innovations of international new ventures, and the effect of following cross-border search is greater than that of Prospective cross-border search, which verifies Hypotheses H1a and H1b.Model 3 shows that exploratory learning (β=0.378, P< 0.01) and exploitative learning (β=0.469, P<0.01) both have a significant positive impact on corporate breakthrough innovation, and the impact of exploitative learning is greater than that of exploratory learning, and hypotheses H2a and H2b are also verified.

Table 3. Regression results of cross-border search on breakthrough innovation of international new ventures through ambidextrous learning

Variables	Dependent variable: Breakthrough Innovation				
	Model 1	Model 2	Model 3	Model 4	Model 5
Control variable					
Enterprise scale	0.044	0.041	0.042	0.043	0.044
Enterprise age	-0.018	-0.017	-0.018	-0.022	-0.019
Independent variables					
Prospective cross-border search		0.208*		0.174*	0.194
Following cross-border search		0.279*		0.196	0.205
Mediating variables					
Exploratory learning			0.378**	0.337**	
Exploitative learning			0.469**		0.409**
R^2	0.095	0.534	0.544	0.553	0.550
ΔR^2	0	0.439	0.010	0.009	0.006
F-value	13.939**	49.836**	44.397**	40.030**	39.534**

Note: *** P < 0.001; ** P < 0.01; * P < 0.05

4.2. Tests of Intermediary Effects

Comparing Model 4 in Table 3 with Model 2, the effects of Prospective and following cross-border search on breakthrough innovation of international new ventures decreased from the original 0.208 (P<0.05) and 0.279 (P<0.05) to 0.174 (P<0.05) and 0.196, respectively, which indicates that exploratory learning plays a partially mediating role in the relationship between Prospective cross-border search and breakthrough innovation of international new ventures. mediating role and fully mediating role between following cross-border search and breakthrough innovation of international new ventures, and hypotheses H3a and H3b are tested. Comparing Model 5 in Table 3 with Model 2, the regression coefficients of Prospective and following cross-border search on breakthrough innovation decreased from 0.208 (P<0.05) and 0.279 (P<0.05) to 0.194 and 0.205, respectively, and both are no longer significant, which indicates that the exploitative learning plays a fully mediating role between Prospective and following cross-border search and breakthrough innovation. role, and hypotheses H4a and H4b are all verified.

5. Conclusions and Implications

Through the hierarchical regression analysis of the sample data of 246 international new ventures, the following key conclusions are drawn: (1) Both Prospective and following cross-border searches have a positive and significant effect on breakthrough innovation of international new ventures. (2) ambidextrous learning has a significant driving influence on breakthrough innovation in both international new ventures, and the influence effect of exploitative learning is greater than that of exploratory learning. (3) ambidextrous learning plays a mediating role between cross-border search and breakthrough innovation, but its mechanism is different. Through the in-depth study of the relationship between cross-border search, binary learning and breakthrough innovation, the following insights are provided: (1) international new ventures should actively promote the application of Prospective and following cross-border search strategies, and strengthen the openness, communication and cooperation with external partners through the construction of interdisciplinary collaborative teams, as well as access to emerging markets and cutting-edge technologies through multiple channels, so as to gain insights into the external demand and distribution of resources with strategic value. (2) international new ventures should emphasize the cultivation of dual-learning capabilities and the improvement of learning mechanisms to flexibly respond to changes in the external environment and precisely adjust their innovation strategies.

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