

How to Benefit From Open Innovation? The Moderating Effect of Open Culture and Open Organization

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Abstract—How to benefit from open innovation (OI) sustainably is a real concern of enterprises. Therefore, the scholars' focus on OI research has gradually shifted to the implementation of OI. Based on the structural contingency theory, structural adaptation theory, and the investigation of 426 enterprises, this study tries to discuss the moderating effect of open culture (OC) and open organization (OO) in the process of inbound open innovation (IOI) and outbound open innovation (OOI) affecting enterprise growth (EG). The results show that both IOI and OOI are positively related to the EG, and their interaction item is also positively related to EG. Besides, OC and OO are positively associated with EG. What is more, both OC and OO can enhance the positive correlation between OOI and EG. However, the moderating effect of OC and OO between IOI and EG is not significant. Furthermore, compared with the IOI, the OOI may need the fitness of OC and OO, so that enterprises can benefit from the open innovation better and sustainably. This article develops the measurement scale of OC and OO in combination with the OI context, expands the research results of organizational culture and organizational structure in the OI context, enriches the research results in the fields of OI, OC, OO, and EG, and provides practical enlightenment on organizational construction for enterprises to benefit from open innovation.

Index Terms—Enterprise growth, inbound open innovation, open culture, open organization, outbound open innovation.

I. INTRODUCTION

IN THE era of sharing economy, more and more Chinese enterprises are changing their innovation strategies from inbound open innovation (IOI), which relies on obtaining innovation resources from external sources unilaterally, to more outbound open innovation (OOI). The enterprises voluntarily

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disclose innovative knowledge rather than keep it [1], and on that basis, they implement IOI and OOI. For example, more and more Chinese enterprises have switched from importing Western technology to self-developed technology [2], and export innovative achievements to Asia, Europe, and Africa through New Silk Road of Innovation [3]. But the open innovation (OI) strategy does not always work. Take Procter and Gamble as an example, once enjoyed great popularity due to its OI model, it is now in a dilemma of sustained implementation of OI due to excessive reliance on external resources, which has led to a decline in internal entrepreneurship and innovation courage. OI research at the national level also shows that OI is negatively related to the international impact of the innovation of a country [3]. The dilemma of the continued failure of OI implementation has led scholars to shift the focus of discussion on OI from “what is OI” and “why OI” to “how to benefit from OI” [4]. What should companies do to better continue to benefit from OI? This is not only a practical problem but also a theoretical one.

According to the existing literature, it can be found that there is still a large divergence of opinion on the role of IOI and OOI in influencing firm performance. It has been found that acquiring technology externally can positively influence an enterprise's innovation performance [5], and that OOI can improve firm performance even if it is through sharing technology for free [6], [7]. However, it has been found that technology purchases lead to increased costs and are negatively correlated with short-term financial performance [8], [9], and that OOI will also not be conducive to firm performance [10]. Why is the implementation of IOI and OOI in enterprises so different?

Most of the existing literature discusses OI in terms of innovation collaboration between firms and external organizations and the use of external information resources and advantages. These research works mostly assumed that external knowledge is both accessible and applicable [11], firms can easily gain benefit from OI with little attention paid to the prerequisites that support OI within the firm [12], ignoring the question of how companies should adapt to the development of OI. In fact, in the era of OI, the implementation of OI means that the external innovation environment and internal task environment that enterprises face have changed, and enterprises face more complex challenges to innovation. For example, Mercedes-Benz found that the existing innovation processes of the company will hinder the innovation

cooperation between enterprises and start-ups [13], which means that the previous innovation processes of the enterprise is no longer applicable to open innovation. According to structural contingency theory and structural adaptation theory, the enterprise's organizational management practices, processes, and structures should be aligned with the external environment, task characteristics, etc. [14], [15]. It is the only way for enterprises to succeed when facing OI changes. Those organizations perform better when their organizational characteristics, such as structure or culture, match the innovation context in which they operate.

In recent years, scholars have become increasingly aware of the importance of OI [16], innovation culture [17], OI platforms [18] to the development of enterprises, emphasizing the OI culture and the construction of open organizational structures [19], [20]. However, the existing studies mainly discuss the relationship between organizational culture and OI adoption, or the relationship between organizational structure and OI adoption. Research works on organizational culture and OI adoption mainly consider that organizational culture is an important factor for enterprises to adopt OI [21], [22], [23], and different cultures have different effects on OI adoption. For example, through empirical research, Alassaf et al. [24] found that the openness of an organization's culture has a significant positive impact on the adoption of OI paradigm. Besides, innovation culture can encourage the IOI and OOI [25], [26], organizational learning culture can promote OI [27], and entrepreneurial culture can promote outside-in OI [28]. What is more, some scholars found that a highly integrative culture [29], [30], adhocracy culture [31] can promote the adoption of OI, while a hierarchy culture [29], [30], [31] discourages the adoption of OI. The research works on organizational structure and OI adoption mainly hold that organizational structure is an antecedent to increase the creation of shared value for OI for sustainability [32], and different structures have different effects on OI adoption. Moellers et al. [33] proposed that the combination of nonmonetary reward system and digital or physical integration mechanism can effectively encourage the internal application of OI initiatives. Besides, organizational structure (formalization, specialization, and centralization) has diverse effects on the OI practices implemented, among them, specialization and centralization can promote the use of IOI and OOI, and formalization has a positive effect on IOI, but negatively affects OOI [34].

Although the above literatures have conducted some research on organizational culture, organizational structure, and OI, these studies mainly discuss the impact of organizational culture and organizational structure on OI adoption from the perspective of "why OI," and do not answer the question of "how to benefit from OI" during the stage of OI implementation. Besides, most scholars disentangle the IOI and OOI, OC, and OO, which are the three dimensions of enterprise openness. The role of OC and OO in the implementation of IOI and OOI is not deeply discussed. There is no empirical research that answers the question of the fitness between OI, OC, and OO. The question of their impact on the long-term growth performance of the enterprises is also less explored. To fill this research gaps, this study intends to empirically investigate the question of how the OI fits with an OC and OO based on structural contingency theory and structural

adaptation theory. Then, provide targeted guidance and advice for enterprises to get more benefit sustainably from the IOI and OOI.

This article contributes to the OI in three ways. First, it broadens the application of structural contingency theory and structural adaptation theory in the field of OI. Existing research works on OI mainly focus on the perspectives of resource dependence, institutional environment, social networks, absorptive capacity, etc. For example, Schuster and Brem [35] discussed the impact of open innovation on enterprise capabilities from the perspective of external partnerships. However, there are few existing studies on how enterprises can benefit from OI from the perspective of the adaptation of internal organizational characteristics, and there is a lack of empirical research on the quantitative analysis of open innovation culture and structure. This study investigates the implementation of OI in enterprises from the innovation culture level, activity level, and organization level by using structural contingency theory and structural adaptation theory. It enriches the research results in the field of structural contingency theory, structural adaptation theory, and OI.

Second, it helps to compensate for the lack of emphasis on culture-level and organization-level openness in previous studies. Unlike current research works that focus only on IOI and OOI at the level of innovation activities, this study also discusses OC and OO at the cultural and organizational levels. It is found that OI not only has a direct impact on EG, but also interacts with OC and OO to influence EG. The findings of this study can remind scholars that future research should focus on analyzing the development of OI of enterprises from a systematic perspective.

Furthermore, it tests that OC and OO are the boundary conditions for enterprises to better benefit from OI. This study treats OI as a systematic project for enterprises to comprehensively and systematically plan and implement innovation based on the logic of open development. It proves that OC and OO are the soft power and hard power, which guarantee enterprises to continuously benefit from OI. This study further enriches the research results in the field of OI and provides guiding suggestions for enterprises' OI development.

The structure of this article is as follows. Section I is the introduction, Section II is the theoretical background and research hypotheses, Section III is the research methods, Section IV is the empirical results, Section V is the discussion, and the Section VI is the conclusion.

II. THEORETICAL BACKGROUND AND HYPOTHESES

A. *Open Innovation and Enterprise Growth*

Open innovation is an innovation model in which enterprises integrate internal and external resources and commercialization channels for value creation and value acquisition [36], [37]. OI can be divided into IOI and OOI [38]. The former refers to how knowledge resources flow from external organizations into the enterprise and are embedded in the enterprise's innovations, while the latter refers to the process by which knowledge resources flow out of the enterprise to external organizations for commercial application. From an innovation perspective,

innovation is usually an essential driver of EG, and accordingly, the slump in EG can be explained by the decline of R&D productivity [39]. In contrast to the traditional closed innovation development logic, the OI development logic emphasizes breaking down organizational boundaries and leveraging the internal and external diversified resources to promote enterprise innovation. First, IOI helps firms to grow by accessing diverse resources. Through metaanalysis, multipurpose resources allow firms to reorganize resources to create new ways to grow up [40]. This, in turn, helps firms to achieve higher levels of growth. For example, firms can access resources from universities and research institutions, scientists and university scholars have a key and important contribution to the firm innovation output in various industries [41], and firms are more likely to bring breakthrough innovations by searching for original knowledge and incorporating it into research and development [42], which in turn leads to EG. Second, OOI can lead to the development of more new and innovative knowledge, which in turn helps the growth of firms. It has been found that the external commercialization of technology enhances firm performance [8], even if the technology is free, it can be used to improve firm performance [7]. In the process of implementing OOI, through technology spillover and diffusion, the export of technology standards and so on, firms' reputation will improve. The elevated status brings the enterprise lucrative income, which in turn helps the enterprise grow up in the long run.

Further, firms, especially technology firms, need to maintain their competitive advantage through continuous innovation and update their knowledge base to safeguard their innovation success [43]. On the one hand, the implementation of IOI happens to be an important way for firms to replenish and update their knowledge base by using external knowledge and technology more quickly, extensively, and in a more diversified way, which can help enterprises to gain competitive advantage [44]. It also enhances the internal R&D capabilities [38] and accumulates the technology base [45] to develop more new technologies and products for the OOI. Through IOI, it is also possible to establish broader linkages with external organizations, which in turn helps firms to fully identify more technology licensing opportunities and induce external commercialization of internal technologies [46]. On the other hand, OOI, where firms externally commercialize valuable internal innovations through paid transfers, can bring additional economic benefits [6], [36], which in turn provides financial support and accumulation of trading skills for IOI [45]. By establishing links with external organizations for technology commercialization, it helps firms to better capture information on market needs and the direction of technology development. This allows firms to identify the external technology and knowledge they need. In a nutshell, there is an interaction effect between external technology acquisition and external commercialization of the technology on the improvement of firm performance [35], in other words, IOI and OOI may interactively affect firm growth.

Summarizing the above analysis, the study proposes the following hypotheses.

H1: IOI is positively related to EG

H2: OOI is positively related to EG.

H3: The interaction of IOI and OOI is positively related to EG.

B. Moderating Effect of Open Culture

Shifting from closed innovation to OI, corporate strategy, culture, and management need to adapt to the new challenges from OI [47], which requires the corporate culture to become more open [38]. Existing research indicates that culture between open and closed innovation units is different, and the OI unit is more open toward risk taking than closed innovation units [48]. Enterprises with a clear innovation culture are different from those that are not [12], different organizational cultures have different effects on enterprise innovation. A good organizational culture is conducive to dealing with external entities and internal integration of organizational resources, thus helping enterprises to adopt OI more smoothly, but a negative culture will hinder cooperative innovation [49]. They have vastly different access to internal and external sources of innovation information, and intraenterprise openness contributes to enterprises' OI. OC refers to the enterprises' open, collaborative, shared, and inclusive values, mindsets, cultural climate, and behaviors. An open organizational culture stems from an open mind [50], and refers to the innovation culture of non-invented-here and non-sold-here [19]. Organizations with OC can reach out to a more diverse external culture, which facilitates individuals to gain novel ideas and knowledge, enhance the creativity of individuals to accomplish tasks [51]. Besides, a culture of open mindedness has a positive effect on environmental product innovation [48], in particular, the higher the environmental uncertainty, the stronger the promotion effect of open mindedness on product innovation [52]. Based on the above analysis, it can be seen that the OC helps promote the innovation output of enterprises, and then affects the growth of enterprises.

According to the contingency theory, different organizational cultures can promote or undermine OI in enterprises. For example, a highly integrated culture contributes to IOI, while the hierarchical culture can hinder IOI and OOI [30]. Usually, cultural misalignment and misunderstanding are the main reasons for the low level of implementation of OI in enterprises [53]. Cultural barriers such as inadequate openness, risk aversion, and organizational inertia can inhibit the success of OI, and thus enterprises should select the organizational culture that is appropriate for the open type in the OI process [54]. OC includes the open vision, values, mindset, and cultural atmosphere that enterprises need to build in order to move from closed innovation model to OI model. It can promote all employees to be more engaged in the entire OI process, stimulating the company to invest more attention and resources in OI, thus to ensure that OI can be carried out smoothly and efficiently. Enterprises with an OC do a better external cooperation and exchange activities than those with a culture of resistance [55]. In other words, OC strengthens an enterprise's cooperation in the external acquisition and external use of technology. As an important component of organizational

characteristics, corporate culture factors not only directly affect innovation performance, but also will interact with the depth and breadth of OI on enterprise innovation performance [56]. According to structural contingency theory, enterprises achieve more when organizational characteristics match the context in which they operate. Organizational culture is an important organizational characteristic. When an enterprise's OC is matched with IOI and OOI, the enterprise will have a better growth performance.

H4: OC is positively related to EG.

H5a: OC positively moderates the relationship between IOI and EG.

H5b: OC positively moderates the relationship between OOI and EG.

C. Moderating Effect of Open Organization

Unlike closed innovation, OI requires enterprises to adopt a matrix or networked organization [57], to develop a new intellectual property regime [36] and a new organization internal and external linking mechanisms [58]. Organizational structure is a pattern of variables established to coordinate the job of the organizational agents, based on their functional division, and whose processes generate formalized, differentiated, and standardized routines [59]. Chiaroni et al. [60] considered that the interorganizational networks, organizational structures, evaluation processes, and knowledge management systems are the four main dimensions of the firm's organization when firms from closed to OI. Based on this, OO is a company that has a series of foundations, which supports the OI like an open organizational structure, network platform, and management mechanism. First, the efficiency of cooperation's internal and external link is affected by the form of organizational structure. Those structures that are decentralized are more conducive to intrateam and interorganizational communication, which in turn enhances innovation performance [61], and has an impact on EG. Second, unlike the traditional offline collaborative innovation model, the OI platform is an online model of mass participation in innovation combining internet technology and OI concept [18]. Internet-based OI platforms help to broaden the number of external innovation sources that companies openly link to, transcending the limitations of time and space. Reducing the cost of research and development and shortening the development cycle can help companies access a more diverse, broader, and more appropriate range of innovative knowledge, which is conducive to its growth. Furthermore, suitable communication and collaboration mechanisms can accelerate the acquisition, assimilation, and application of external technological knowledge, which in turn contributes to speeding up the new product development [62], which is good for EG.

According to the contingency theory, no static management style can be applied to all organizations, and the structure and management of the organization should change when the strategy, technology, environment, and other factors change [63]. When a company moves from closed to OI, at this point, the organization's innovation strategy and task context have changed. If it does not correspondingly adjust the organizational structure,

there will be a mismatch between the organizational structure and situational factors, which in turn will reduce organizational performance [64], and this does no good to business growth. Marin-Idarraga et al. [59] integrated the structural contingency theory and the organizational adaptation theory to analyze the impact of organizational structure on convergent change, and found that differentiation and formalization can promote convergent change, but centralization has no significant effect on convergent change. It can be seen that different organizational structures are applicable to different organizational changes and thus have different impacts on innovation. Compared with mechanic structures, OI is more suitable for the development in organic structures [65]. Compared to organizations whose characteristics do not match the OI context, those who match the OI context are likely to have better performance. Besides, organizational structure is embedded in the institutional and organizational environment, and the structural context can shape the social interactions [66], which is conducive to the implementation of enterprise cooperative innovation. The OO refers to the new organizational structure, innovation platform, management mechanism, etc., it is an organizational form suitable for OI situations. Especially in the digital era, OI is increasingly carried out around the platform ecosystem, which makes the complex interconnection of cross digital platforms and products a new challenge for OI management [67]. The adoption of digital platforms for collaborative innovations can promote the creative process and reduce the transaction costs [68]. OI digital platforms can promote the problem definition, finding participants and external collaboration of coupled OI processes through dynamic capabilities, such as sensing, seizing, scanning, integrating, and transforming [69]. For enterprises implementing OI, OI digital platforms can help firms to find partners and financial resources, and then promote the knowledge cocreation of firms [70]. Collaborative innovation platform can facilitate enterprises to publish and obtain innovation information, help enterprises to obtain technology and resource support, and promote enterprise innovation output [71]. The depth of platform openness has a significant moderating role between coupling OI and innovation performance [72]. Both open structure and open platform belong to the construction of OO under OI. They serve the OI of resource acquisition, absorption, and application. It can accelerate the output of new technologies and products, thereby amplifying the role of IOI and OOI in influencing EG. From the viewpoint of structural contingency theory and structural adaptation theory, it can be hypothesized that when OO is matched with IOI and OOI, the enterprise will get better growth performance.

Summarizing the above analysis, the study proposes the following hypotheses.

H6: OO is positively related to EG.

H7a: OO positively moderates the relationship between IOI and EG.

H7b: OO positively moderates the relationship between OOI and EG.

Summarizing the above analysis and hypotheses, this study proposes the following conceptual framework, as shown in Fig. 1.

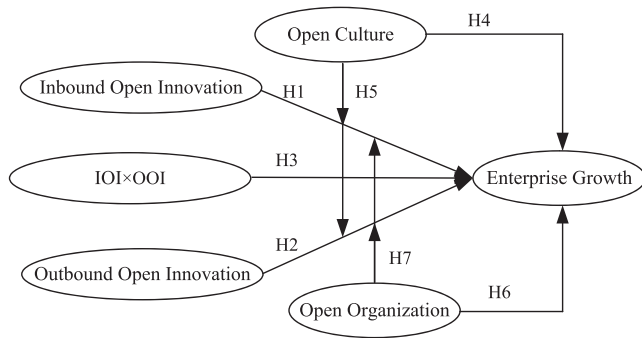


Fig. 1. Conceptual framework.

III. METHODS

A. Sample and Procedure

Considering that OC and OO are difficult to measure through objective data, this study used a questionnaire to obtain the research data. The data for this study come from China, which was obtained in two ways. First, by relying on research topics commissioned by the Chinese government's science and technology department and the training event for managers of science and technology enterprises, we distributed 300 pretested questionnaires, which are filled out by middle and senior management and core technical staff. After eliminating the questionnaires that were completely blank, missing a lot of questions and filled out randomly, 229 questionnaires remained valid, with an effective response rate of 76.333%. Second, the electronic version of the questionnaire is distributed by large enterprise that have cooperative relations with us. We require the large enterprise to randomly select 500 cooperative enterprises from their internal management system and send them emails. These questionnaires are filled out by middle and upper managers, core technical staff who are familiar with the company's innovations. Samples filled by those who are with less than one year of service in the current company, missing more than three questions, or with obvious patterns of responses were excluded. In the end, 426 valid questionnaires were returned, a valid response rate of 85.2%. Among them, 71, 183, 129, and 43 companies have been established for less than 8 years, 9–19 years, 20–30 years, and more than 30 years, respectively. Forty state-owned enterprises, 322 private enterprises, 27 wholly foreign-owned enterprises, 17 Sino-foreign joint ventures, and 20 other enterprises. There are 4, 163, 115, and 144 enterprises with less than 20 people, 20–299 people, 300–999 people, and more than 1000 people, respectively. One hundred sixty-one enterprises are emerging industries, 235 enterprises are traditional industries, and 30 enterprises in other industries. In the past three years, the average proportion of research and development expenditure to operating income is less than 1% for 32 companies, 1%–3% for 81 companies, 4%–6% for 121 companies, 7%–10% for 95 companies, 11%–15% for 48 companies, and 16% or more for 49 companies. Most of the sample enterprises attach great importance to innovation, so it is suitable to be the analysis object of this study.

B. Measures

This study searched authoritative journals to find measurement scales for similar concepts and select relevant and mature ones with better reliability and validity. A combination of parallel and back translation is used for the English measurement items to ensure the scientific validity of the scale translation to best match between the source questionnaire and the target questionnaire. Based on this, eight peers were invited to discuss and revise the wording and expression of the measurement items to ensure that the questionnaire has good content validity and accuracy.

According to the views of Chesbrough and Crowther [38] and Hung and Chou [37], OI includes two dimensions: IOI and OOI. The measurement of IOI and OOI is mainly referenced to the perspectives of Hung and Chou [37], Cheng and Huizingh [73], as well as Cassiman and Valentini [5] et al. The initial measurement items of IOI and OOI are four, respectively.

From closed innovation to open innovation, enterprise culture needs to be more open [36], including open innovation climate [74] and open mindedness [50]. Open innovation climate includes an open, cooperative, sharing, and tolerant of failure cultural atmosphere and an atmosphere in which everyone participates in innovation. It means that innovation is not only the task of R&D department staff, but also the work of all employees. Innovation is not limited to invented-here, but also includes noninvented-here [19]. Organizational culture is the culture of enterprise leaders. Therefore, this study mainly measures the enterprise's open culture from the open mindedness of the leaders, including the leaders who have open mindedness, and the leaders who often encourage and advocate employees to open learning. The OC scale contains four items.

The transformation from closed innovation to open innovation will bring about organizational changes, including organizational mechanism changes (centralization/decentralization) and organizational structure changes (functional / matrix / network) [57]. The biggest changes in enterprises are the emergence of open innovation platforms and the transformation of organizational mechanisms. The open innovation platform includes open sharing platforms for internal enterprises and open innovation network platforms for external organizations. The change of organizational mechanism refers to the change from the original internal independent R&D mechanism to the external open cooperation mechanism. Considering that enterprises will choose different organizational modes according to different partners in the process of implementing IOI and OOI [75]. When an enterprise is open to internal departments, it usually adopts the new organization mode of open sharing platforms. When an enterprise is open to external organizations, it usually adopts the new organization mode of open innovation network platforms. When integrating internal and external resources and commercialization channels, enterprises will adopt the new organizational mechanism of internal and external collaboration and innovation mechanism. The OO scale contains three items.

Given that sales revenue growth rate and market share are important indicators of EG [76], and the growth rate of corporate profits is an important indicator of the sustainability of

TABLE I
RELIABILITY AND VALIDITY TEST RESULTS OF MEASUREMENT SCALE ($N = 229$)

Variables	Items	EFA Loading	Total VCI	Cronbach's Alpha	CR
Inbound Open Innovation (IOI)	Constantly seek out and bring in external knowledge, information, technology, product ideas, etc.	0.890	44.561%	0.876	0.855
	Often embed externally developed knowledge and technology into their technology and product development	0.905			
	Regular search for technologies and patents from other companies, R&D institutions, or universities	0.744			
	Purchase of external intellectual property for use in technology development or product development	0.506			
OI	Commercialization by external organizations through licensing, technology transfer, etc.	0.833	78.366%	0.891	0.898
	Transfer of incomplete or terminated technology development or product development projects to third-party organizations (e.g. cooperative partners, cross-industry companies, R&D institutions, universities, etc.)	0.890			
Outbound Open Innovation (OOI)	Frequently involved in the commercialization of new technology or product projects of other enterprises	0.730	80.730%	0.920	0.944
	Sale of intellectual property for commercial value	0.859			
	The company has a culture of openness, cooperation, sharing, and tolerance	0.881			
	The company has created an atmosphere in which everyone participates in innovation	0.893			
Open Culture (OO)	Open-minded company leadership	0.907	73.356%	0.815	0.892
	Company leaders often encourage and advocate for employees to be open to learning	0.912			
	Open sharing platforms within the company (e.g. standards repository, knowledge base, etc.)	0.814			
	Companies have built open innovation network platforms (e.g., virtual communities)	0.847			
Open Organization (OO)	The company has a perfect internal and external collaboration and innovation mechanism (such as innovation exchange meeting, industry-university-research collaboration, etc.)	0.906	83.979%	0.904	0.940
	Higher sales revenue growth rate compared to its competitors	0.921			
	Higher market share compared to its competitors	0.905			
Enterprise Growth (EG)	Higher pre-tax earnings growth compared to its competitors	0.923			

a company [77], this study measures EG in three aspects: sales revenue growth rate, market share, and pretax profit growth rate.

All of the above variables were measured on a Likert five-point scale, and the specific items measured are shown in Table I. Besides, considering that age, size, and industry can affect OI and performance, the age of the enterprise, the ownership of enterprise, enterprise size, industry type, R&D intensity, and political connection are considered as control variables. Among them, R&D intensity is measured by the ratio of the enterprise's R&D investment to its business revenue, and political connection is measured by the political affiliation of the enterprise's actual controller. Suppose the chairman or general manager is a former or current government official, a deputy to the National People's Congress, a Party deputy or a member of the Chinese People's Political Consultative Conference. If so, score 1. Otherwise, score 0.

C. Common Variance and Nonresponse Bias

To reduce the effect of common variance when the questionnaire is filled out by the same respondent, the study was conducted by setting a discriminative reverse question "Company management generally did not find open cooperation meaningful" to exclude contradictory samples, and took the step of filling

in the form anonymously, informing that it was for the sole purpose of academic research, there is no right or wrong answer, to reduce the concern of the filler and to exclude inconsistent samples. To test whether the feedforward control is effective, this article conducts a back-test through Harman's one-factor test. The more variation explained by Factor I, the more severe the bias. The exploratory factor analysis took five factors, the results showed that the Factor I explained 19.742% of the variation, for a total variation of 74.758%. The Factor I did not account for half of the total variation, indicating that common bias is not serious. Also, the results of the confirmatory factor analysis in Table II show that the fit indices of the one-factor model did not meet the standard values and it is the worst fit in all competition models. It indicates that the common bias is not a serious problem in this study again.

This study refers to the suggestion of Armstrong and Overton [78] and Harrington and Harrington [79] for the test of non-response bias. First, the returned questionnaires were grouped in order of priority, and the 164 questionnaires collected after repeated urging were regarded as unresponsive questionnaires. Second, the objective items such as enterprise age, the total number of employees, the ownership of enterprise, industry type, and R&D intensity were selected for the independent sample t -test, which showed that there was no significant difference between

TABLE II
RESULTS OF CONFIRMATORY FACTOR ANALYSES ($N = 426$)

Model	χ^2	df	χ^2/df	$\Delta\chi^2 (\Delta df)$	CFI	TLI	RMSEA (90% CI)	SRMR
5Factor	352.473	109	3.233	—	0.943	0.929	0.072 (0.064, 0.081)***	0.058
4Factor	670.168	113	5.931	317.695 (4)***	0.869	0.842	0.108 (0.100, 0.116)***	0.072
3Factor	782.935	116	6.749	430.462 (7)***	0.843	0.816	0.116 (0.109, 0.124)***	0.084
2Factor	1179.218	118	9.993	826.745 (9)***	0.751	0.713	0.145(0.138, 0.153)***	0.094
1Factor	1505.548	119	12.652	1153.080 (10)***	0.674	0.628	0.165 (0.158, 0.173)***	0.102

Note: (1) 5 Factor: IOI, OOI, OC, OO, EG. (2) 4 Factor: IOI+OOI, OC, OO, EG. (3) 3 Factor: IOI+OOI, OC+OO, EG. (4) 2 Factor: IOI+OOI+OC+OO, EG. (5) 1 Factor: IOI+OOI+OC+OO+EG.

the two groups, indicating that there was no nonresponse bias in the data.

IV. RESULTS

A. Validity and Reliability of the Scale

The results of exploratory factor analysis (EFA) and confidence test (see Table I) show that the internal consistency coefficient alpha values for IOI, OOI, OC, OO, and EG are 0.869, 0.891, 0.920, 0.815, and 0.904, all more than the benchmark value of 0.7. The test-retest reliability coefficient for the 426 formal survey samples was 0.836, 0.842, 0.883, 0.769, and 0.874, the CR value of each scale is more than 0.775, indicating that the scales used in this article have good internal consistency and reliability.

Second, this study conducted EFA on 229 pretest questionnaires through R software. We treat the ordinal Likert scale as a discontinuous variable and adopt the method of factor analysis using polychoric matrix provided by Wu (2018).¹ We do the EFA with oblimin, maximum likelihood, polychoric approach. The project analysis results show that the discrimination of all items of each variable is between 0.59 and 0.77, which is greater than 0.3. The discrimination of all items is high, and all items are retained. The KMO test results of OI, OC, OO, EG were 0.88, 0.85, 0.67, and 0.75, respectively, which were all within the acceptable standard range. The Bartlett's sphericity test results of OI ($\chi^2 (28) = 1345.661, p < 0.001$), OC ($\chi^2 (6) = 665.528, p < 0.001$), OO ($\chi^2 (3) = 257.423, p < 0.001$), EG ($\chi^2 (3) = 439.058, p < 0.001$) were all statistically significant. Then, we do parallel analysis using the correlation coefficient of the polychoric matrix to determine the number of retained factors. The EFA results of OI show that in the scree test, starting from the third factor, the number of characteristic roots changes little, and the two factors before the inflection point can be retained. The results of parallel analysis suggested that the number of retention factors should be two. The factor loading of item 4 of IOI is less than 0.4 in the IOI dimension, delete IOI4 (item: purchase of external intellectual property for use in technology development or product development). The percentage of total variance explained accounted for 79%, exceeding the general recommended standard of 60%. The factor loading is between

0.69 and 1, and the commonality of the measurement indexes is between 0.71 and 0.94, indicating that the scale has good validity. The EFA results of OC, OO, EG show that in the scree test, starting from the second factor, the number of characteristic roots changes little, and the one factors before the inflection point can be retained. The results of parallel analysis suggested that the retention factors number of OC, OO, EG all should be one. The percentage of total variance explained of OC, OO, EG accounted for 85%, 70%, 84%, respectively, exceeding the general recommended standard of 60%. The factor loading of OC is between 0.89 and 0.95, and the commonality of the measurement indexes is between 0.81 and 0.91, indicating that OC has good validity. The factor loading of OO is between 0.72 and 1, and the commonality of the measurement indexes is between 0.52 and 1, indicating that OO has good validity. The factor loading of EG is between 0.89 and 0.93, and the commonality of the measurement indexes is between 0.80 and 0.86, indicating that EG has good validity. The results of EFA are shown in Table I. It can be seen that OI, OC, OO, and EG all have good aggregation validity.

In addition, to test the discriminant validity of the five variables, this study conducted a confirmatory factor analysis (CFA) of 426 formal survey data using R software. The five factor model is shown in Fig. 2. The results of CFA showed that the factor loadings for all measured items under the five-factor model ranged from 0.64 to 0.88. The mean-variance extraction AVE values are all above 0.5, indicating that the measurement scale in this study has good aggregation validity. Furthermore, the results of the validation factor analysis competition model (see Table II for details) show that compared to single-factor model, two-factor model, three-factor model, and four-factor model, five-factor model had the best fit ($\chi^2/df = 3.233, SRMR < 0.08, RMSEA < 0.08, CFI > 0.9, TLI > 0.9$). It demonstrates that the five-factor model is a better representation of the measured constructs. The measurement scales used in this article have good discriminatory validity. Besides, the AVE square roots of each core variable are greater than the correlation coefficients between the variables (see Table III for details), again indicating good discriminant validity between the core variables.

B. Descriptive Statistics and Related Analysis

The results of the descriptive statistics and correlation analysis in Table III show that the mean value of IOI ($m = 4.250$) is higher than the OOI ($m = 3.784$), OC ($m = 4.385$) is higher than OO ($m = 4.097$), indicating that the sample enterprises

¹Jiayu Wu (2018). Gender Difference in Movie Genre Preferences Factor Analysis on Ordinal Data-R Code for Replication. [Online]. Available: [https://alice86.github.io/2018/04/08/Factor-Analysis-on-Ordinal-Data-example-in-R-\(psych,-homals\)/](https://alice86.github.io/2018/04/08/Factor-Analysis-on-Ordinal-Data-example-in-R-(psych,-homals)/)

TABLE III
DESCRIPTIVE STATISTICS AND CORRELATION MATRIX ($N = 426$)

Variables	1	2	3	4	5
1.Enterprise Growth	0.807				
2.Inbound Open Innovation	0.450**	0.778			
3.Outbound Open Innovation	0.539**	0.521**	0.811		
4.Open Culture	0.491**	0.473**	0.452**	0.733	
5.Open Organization	0.569**	0.472**	0.589**	0.651**	0.837
<i>M</i>	4.031	4.250	3.784	4.385	4.097
<i>SD</i>	0.677	0.641	0.806	0.554	0.660

Note 1: ** $p < 0.010$, * $p < 0.050$. Note 2: The bold part in the table is the AVE square root of each latent variable.

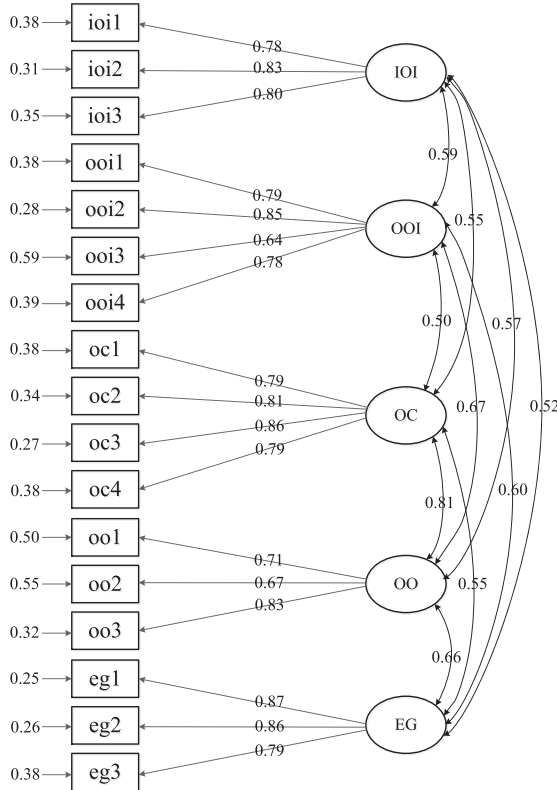


Fig. 2. Five factor model.

implemented relatively more IOI, and the OC was better than the OO building, which is consistent with the findings from the field visits. In addition, there is a significant positive mutual correlation between EG, IOI, OOI, OC, and OO. The correlation coefficients are between 0.450 and 0.651, preliminarily supports the hypothesis of this study.

C. Multivariable Regression Analysis and Hypothesis Testing

This study uses hierarchical regression analysis to examine the relationship between IOI and OOI, OC, OO, and EG. First put in the control variables, then put in the explanatory variable like IOI and OOI, OC, and OO, as well as their interactions. Calculating the product term based on standardization of the variables, the analysis shows that the VIF values for all regression models are between 1.055 and 1.905, all are less than the benchmark value of 10, indicating that the multicollinearity problem in this study

was effectively controlled. The results of the regression analysis are shown in Table IV.

- 1) A test of the relationship between IOI and OOI and EG. The effects of IOI and OOI on EG are shown in Models M2 and M3 in Table IV. The results indicate that IOI and OOI are all significantly and positively related to EG ($\beta = 0.222, p < 0.001$; $\beta = 0.379, p < 0.001$), that is, IOI and OOI are beneficial for EG. Further, the interaction of IOI and OOI is significantly positively related to EG ($\beta = 0.144, p < 0.001$), suggesting that IOI and OOI have complementary effects on EG. H1, H2, and H3 are all supported.
- 2) Testing the moderating effect of OC. The moderating effect of OC is shown in models M4 and M5 in Table IV. The results show that OC has a significant effect on EG ($\beta = 0.229, p < 0.001$), which indicates that the better the company's OC is built, the better the enterprise grows. Further, OC positively moderates the positive correlation between OOI and EG ($\beta = 0.146, p < 0.001$), while the moderating effect of OC on the relationship between IOI and EG is not significant ($\beta = 0.036, p > 0.100$). This indicates that the positive correlation between OOI and EG is stronger in a high OC. In other words, OOI may require a more OC than IOI in order for enterprises to gain more benefit from OI. H4 and H5b are supported.
- 3) Tests of the moderating effect of OO. The moderating effect of OO is shown in models M6 and M7 in Table IV. The results show that OO have a significant effect on EG ($\beta = 0.312, p < 0.001$). It indicates that the better the enterprise's OO, the better the enterprise grows. Further, OO positively moderate the positive correlation of OOI on EG ($\beta = 0.185, p < 0.001$), while the moderating effect of OO on the relationship between IOI and EG is not significant ($\beta = -0.058, p > 0.100$), indicating that OOI and EG in highly OO has a stronger positive correlation. In other words, OOI may require more OO than IOI for enterprises to benefit more from OI. H6 and H7b are supported.
- 4) Further analysis: the moderating role of OO on the relationship between OC and EG. According to Pugh and Hickson [80] and Joseph and Gaba [66], the structure should change with the change of the environment, and the research on the organizational structure should consider its context. Organizational culture belongs to the internal environment of an enterprise. The matching of organizational structure and organizational culture should

TABLE IV
RESULTS OF HIERARCHICAL REGRESSION ANALYSIS ($N = 426$)

Variables	Enterprise Growth								
	M1	M2	M3	M4	M5	M6	M7	M8	M9
Constant	3.591	1.599	1.534	0.963	0.827	1.139	1.068	1.185	0.922
Age of Enterprise	-0.041	-0.027	-0.019	-0.003	-0.003	0.018	0.019	0.047	0.024
Ownership of Enterprise	-0.078	-0.098*	-0.087*	-0.091	-0.089*	-0.088*	-0.085*	-0.088*	-0.091*
Enterprise Size	0.089	0.039	0.028	0.016	0.009	0.001	0.007	-0.013	-0.012
Industry Type	0.010	0.004	0.010	-0.007	-0.008	-0.004	-0.009	-0.013	-0.025
R & D intensity	0.192***	0.145***	0.129**	0.109**	0.102*	0.087*	0.088*	0.055	0.047
Political connection	0.191***	0.126**	0.128**	0.123**	0.131***	0.133***	0.133***	0.156***	0.162***
IOI		0.222***	0.266***	0.150***	0.121**	0.154***	0.105*		
OOI		0.379***	0.331***	0.320***	0.290***	0.240***	0.242***		
IOI×OOI			0.144***						
OC				0.229***	0.292***			0.189***	0.248***
OO						0.312***	0.366***	0.413***	0.394***
IOI×OC					0.036				
OOI×OC					0.146***				
IOI×OO							-0.058		
OOI×OO							0.185***		
OC×OO									0.162***
Adj. R^2	0.109	0.378	0.395	0.412	0.434	0.432	0.454	0.392	0.403
ΔR^2	--	0.268	0.018	0.035	0.024	0.054	0.024	0.271	0.024
F	9.630***	33.232***	31.784***	34.115***	30.638***	36.881***	33.124***	33.586***	32.868***

Note 1: *** $p < 0.001$, ** $p < 0.010$, * $p < 0.050$.

TABLE V
RESULTS HYPOTHESIS TESTING RESULTS

Effects	Hypotheses	Results
Main effect	H1: IOI is positively related to EG.	Supported
	H2: OOI is positively related to EG.	Supported
	H3: The interaction of IOI and OOI is positively related to EG.	Supported
	H4: OC is positively related to EG.	Supported
	H6: OO is positively related to EG.	Supported
	Moderating effect	H5a: OC positively moderates the relationship between IOI and EG.
H5b: OC positively moderates the relationship between OOI and EG.		Supported
H7a: OO positively moderates the relationship between IOI and EG.		Not Supported
H7b: OO positively moderates the relationship between OOI and EG.		Supported

theoretically promote the growth of an enterprise. In order to further verify whether the matching of open organization to open innovation situations is conducive to the growth of enterprises, this article regards OC as the environment and atmosphere of open innovation in which open organization are located, and then tests the moderating role of OO between OC and EG. See models M8 and M9 in Table IV. The results of model M8 show that OC and OO can promote the growth of enterprises ($\beta = 0.189$, $P < 0.001$; $\beta = 0.413$, $P < 0.001$), which verified H4 and H6 again. The results of model M8 show that the interaction between OC and OO positively affects EG ($\beta = 0.162$, $P < 0.001$), indicating that OO play a positive moderating role in the process of OC promoting EG, and high OO are more conducive to OC promoting EG. The results of the study verify again that the matching of OO and open innovation environment is conducive to the EG, and also prove that the matching of OO and OC is conducive to the EG. In this study, the simple slope test and diagram method is used to intuitively show the moderating role of OO and OC between OOI and EG. Fig. 3(a) show the correlation between OOI and EG under low OO and high OO. There are significant differences:

high OO are more conducive to EG in OOI enterprises, while the positive correlation between OOI and EG in low OO is not significant. In other words, the better the OO construction, the stronger the positive correlation between OOI and EG. Similarly, Fig. 3(b) shows that the better the OC construction, the stronger the positive relationship between OOI and EG. Table V summarizes the hypothesis testing results. Except that H5a and H7a are not supported, other hypotheses are all supported.

V. DISCUSSION

To answer the question, what can companies do to better benefit from OI? This study builds the research model of IOI and OOI, OC, OO, and EG based on structural contingency theory and structural adaptation theory, and empirically explored by questionnaire survey, the following research findings are mainly obtained.

First, IOI and OOI are not only significantly correlated with EG, respectively, but also interactively. The results of the empirical analysis support the hypotheses that IOI and OOI are significantly positively correlated with EG, indicating that IOI and OOI can be a strategic choice for EG. IOI and OOI can

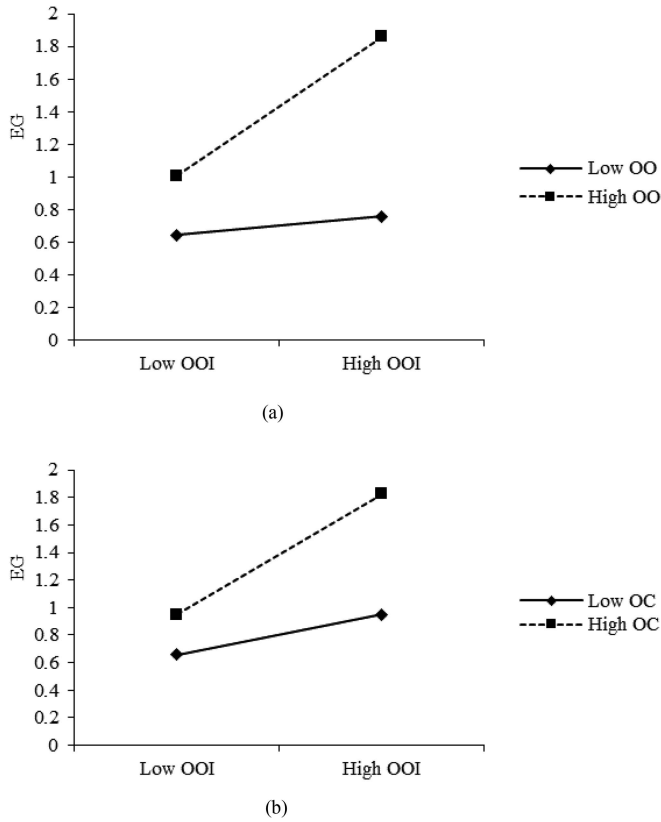


Fig. 3. (a) Moderating effect of OO between OOI and EG. (b) Moderating effect of OC between OOI and EG.

influence the EG interactively, indicating that IOI and OOI are complementary to the growth of enterprises. Although some studies have found that open innovation is not conducive to enterprise performance in the short term [8], [9], [10], this article finds that both IOI and OOI are conducive to EG in the long term and the promotion of IOI and OOI on EG has complementary effect rather than substitution effect.

Second, OC and OO are the critical soft power and hard power that affect the growth of enterprises. The empirical test results support the hypotheses that OC and OO have a positive influence on EG. The findings of this study are similar to the “open mindedness has a positive effect on product innovation” found by Cegarra-Navarro et al. [50] and Lin et al. [52], and verify the perspectives of Hallerstedde [16] and Moran [81] on the relationship between network platforms, organizational structure, and innovation performance. The results show that OC and OO can positively influence EG. Thus, in addition to IOI and OOI, OC and OO are also relevant factors for EG.

Third, the matching of OC, OO, and OOI leads to better EG. Empirical data show that the interaction of OC, OO, and OOI all have a significant positive impact on EG, which is consistent with the assumptions under the structural contingency theory perspective. The results show that when the OC and OO are matched with the context required for OOI, the OOI can lead to better EG. However, the effect of the OC, OO, and IOI interactions on EG is not significant. The results suggest that OOI may require more corporation of OC and OO

for enterprises to better benefit from OI. For enterprises, the intellectual property protection system in developing countries is not well developed, and enterprises may face more risks in implementing OOI. Thus, there is a more need for a sound institutional mechanism to ensure this. Besides, technologies sourced from outside the organization are often readily accepted by staff, whereas the transfer of technologies that take a lot of effort and resources to develop is often not readily accepted by staff. The transfer of technology to third party organizations for commercialization is met with psychological and behavioral resistance from employees [82]. Therefore, compared with IOI, OOI will more require an OC to coordinate. Also, according to structural adaptation theory [15], the insignificant moderating effect of OO and OC on IOI and EG may be influenced by historical factors. Most Chinese enterprises have undergone the process of IOI by importing, digesting, absorbing, and reinventing, which may have been adapted to the original organizational structure and organizational culture.

A. Theoretical Implications

The above findings contribute to the existing research about OI and firm performance, organizational culture, and organizational structure in the following aspects.

First, this article enriches the research results in the field of OI and enterprise performance. Previous studies have found that IOI and OOI have a positive impact on the short-term innovation performance or financial performance of enterprises [83], [84], [85], [86], or a negative impact [8], [9], [10], [87]. For example, IOI practices such as purchasing intellectual property rights has a positive influence on firm performance, but OOI practices, such as selling intellectual property rights has a negative influence on firm performance [88]. Through empirical research, this article finds that both IOI and OOI can help improve the growth performance of enterprises, such as the growth rate of sales revenue, market share, and profit before tax. That is to say, in the long run, IOI and OOI can help improve the growth performance of enterprises in terms of long-term growth. Therefore, the future research on OI and enterprise performance should not only separately explore the role difference between IOI and OOI, but also separately explore the difference between long-term performance and short-term performance. In addition, the interaction analysis found that IOI and OOI have an interactive effect on the growth performance of enterprises, rather than a substitution effect. This is similar to the result of “the combination of inbound and outbound OI has a stronger effect on innovation output than the inbound or outbound OI alone” found by Nguyen et al. [89], indicating that IOI and OOI can promote EG interactively.

Second, this article expands the research perspective and research results in the field of OC, OO, and enterprise innovation. Previous studies mainly explored the influence of organizational culture on OI adoption [21], [22], [23] and organizational structure on OI adoption [32], [33] from the perspective of antecedents of OI. Moreover, the existing studies mainly consider the moderating factors of OI affecting enterprise performance from the perspective of enterprise capability. For example, from the perspective of capability, it discusses the moderating role

of technical capability and market information management capability on the relationship between OI and enterprise performance [90], discusses the moderating role of alliance management capability and absorptive capacity on inbound/outbound strategies and eco-innovation performance [91], and explores the moderating role of network capabilities and innovation capabilities between OI and radical innovation [85]. In addition, some studies discuss the moderating effect of organizational mechanisms (formalization, decentralization) between OI and firm performance from the perspective of organizational mechanism and found that the decentralization has a positive moderating effect between OOI and firm performance, while the formalization has a negative moderating effect between OOI and firm performance [83]. Although the existing studies have found that it is conditional for enterprises to benefit from OI from the perspective of capability and organizational mechanism, there is still a lack of discussion on how enterprises can benefit from OI from the perspective of organizational culture and organizational structure adaptation. Different from previous studies which measured organizational culture and organizational structure from the conventional context, this article developed a measurement scale of OC and OO based on the context of open innovation. Different from the existing research perspective, this article discusses the moderating role of OC and OO between OI and EG performance from the perspective of culture, organization, and innovation adaptation, and verifies that OC and OO are the boundary conditions for enterprises to better benefit from OOI. This article can not only provide measurement tools for future empirical research on OC and OO, but also enrich the research results in the field of OC, OO, and enterprise innovation.

Third, after summarizing and sorting out the literature on organizational structure, Joseph and Gaba [66] proposed that future research needs to pay more attention to the impact of structural context. The research on organizational structure and organizational culture should be combined with its structural context and culture context. However, most of the existing studies on organizational culture, organizational structure, and OI do not combine with OI context. This study helps to fill this research gap. This article developed the measurement tools of OC and OO by combining OI context, and uses the structural contingency theory and structural adaptation theory to explore the implementation of OI in enterprises from the OI culture level, OI activity level, and OI organization level. Existing studies have found that different organizational mechanisms have different effects on the implementation of OI. For example, the moderating effects of decentralization and formalization between OI and firm performance were positive and negative, respectively [83]. The reason may be that decentralization and OI fit, while formalization and OI misfit. When an enterprise implements OI, if the enterprise is still the traditional closed innovation organizational culture and organizational structure, there will be a misfit between organizational culture, organizational structure, and contingency factors (OI), which will reduce enterprise performance. When an enterprise builds an OC and an OO in the process of implementing OI, the organizational culture and organizational structure will be regain fit with contingency factors (OI). This regain fit will help to improve enterprise performance. The findings of this

article expand the application of structural adjustment to regain fit model proposed by Donaldson [92] in the field of OI, and enrich the research results in the field of structural contingency theory, structural adaptation theory, and OI. Both the structural contingency theory and the structural adaptation theory believe that the structure of an organization should match the characteristics of its tasks. This article finds that the organizational structure and the organizational culture should be adjusted according to the task situation, and the matching of OI with OO and OC is more conducive to the growth of enterprises. This is the view found in this article that culture and structure should match the task situation. This view is not only applicable to the OI field, but also can be used to explain other enterprise innovation and development phenomena, such as enterprise digital transformation. The digital transformation of enterprises also requires the development of organizational culture and organizational structure toward the digital direction, the cultivation of digital thinking, and the construction of a digital platform.

B. Practical Implications

This article has the following practical implications. First, the research findings that open innovation can promote the growth of enterprises provide important practical value for enterprises to implement partner-oriented, market-oriented, and regional-oriented opening. Companies should acquire knowledge, information, technology, and product ideas from external organizations such as higher education institutions, research institutions, partners, and competitors in their innovation process and incorporate them into their technology research and product development activities. Meanwhile, appropriate technology licensing, technology transfer, and commercial application through external organizations are also effective means for companies to obtain demand information, market-entry, and economic benefits. Furthermore, enterprises should cross organizational and regional boundaries to carry out open and cooperative innovation, and break the boundary barriers of knowledge flow. In addition, enterprises should also pay attention to the improvement of the ability to acquire and utilize external technology simultaneously, thus creates and acquires more value in technology research, product development, and marketing promotion.

Second, to move from closed innovation development to OI development, not only does the R&D department need to decide on the OI implementation strategy and the degree of openness, but also all other departments need to help build an OC and OO to help shift the awareness and perception of innovation development among all employees, as well as update and equip the implementation resources, organizational structure, and institutional arrangements accordingly. For example, enterprise leaders should have an open mind and often encourage and advocate open learning for employees to create a culture of openness, cooperation, sharing, and toleration, forming an atmosphere of innovation for mass involvement. Also, to facilitate the ideas exchange between employees, strengthen the interaction and cooperation between enterprises and external organizations, and thus better protect the smooth development of OI. Enterprises

should design the office space into an open space, build an OI network platform connected with the outside world based on internet information technology and improve internal and external collaboration and innovation mechanisms.

Third, in view of the positive moderating role of OC and OO between OOI and EG, enterprises should pay attention to the synchronous enhancement of OC, OO, and OI activities. In the process of OI development, enterprises should not only pay attention to the open access and commercialization of value-creating activities, but also attach great importance to the construction of OC and OO, build a comprehensive OI system, and coordinate the relationship between OC, OO, and OI. According to the changes of innovation environment, enterprises should adjust the organizational structure and organizational culture in a timely manner, so that the organizational structure, organizational culture, and innovation activities of enterprises can be matched again, and then promote the growth of enterprises.

C. Limitations and Future Direction

This study still has some limitations for future research improvement. First, the analysis sample of this study is limited to Chinese enterprises and cannot be used for comparative analysis of different national cultures. According to the existing research, enterprises need to overcome the OI capability gap [93] and overcome cognitive barriers, such as developing innovation consistent with Chinese culture [94]. Culture includes both internal organizational culture and external cultural factors that impact employees' attitudes, abilities, skills, motivation, and intention to participate in an open, risk-embracing, collaborative culture that emphasizes experimentation and the free flowing of information [22]. Therefore, the future research should carry out international cooperation research and select enterprises from multiple countries as the analysis object. In addition to considering the internal culture of enterprises, the impact of different national cultures on the implementation of OI of enterprises should be considered. Second, although the common method feedforward control design was carried out and the problem of common method bias testing is not serious, it is preferable to adopt both subjective and objective data in the future and filled in by different managers to ensure objectivity and accuracy of the data. Besides, due to difficulties in obtaining enterprise-level data, this study uses cross-sectional data for analysis, which does not reflect the OI to the time lag of EG, ignoring the changes in corporate culture and organizational characteristics. Therefore, in the future, it is best to adopt a longitudinal tracking method to investigate the changes in OC and OO and obstacles in the process. And then analyze the impact of these changes and obstacles on the EG. Third, this study only explores the boundary conditions for enterprises to benefit from OI in terms of OC and OO. In fact, there are many factors that affect enterprises to benefit from OI. The choice of enterprises' OI strategies and the construction of OC and OO may vary under different organizational cognition. Therefore, future research should explore the boundary conditions and transmission mechanism for enterprises to continuously benefit from open innovation from the perspective of organizational cognition.

VI. CONCLUSION

This article analyzed the important role of IOI and OOI as the key factors affecting the growth of enterprises, and discusses the interactive promotion of IOI and OOI on the growth of enterprises. The results show that the growth performance of enterprises will be better when they implement the strategy of high IOI and high OOI. The results also show that when the enterprise has a higher OC and a higher OO, the OOI has a stronger role in promoting the growth of the enterprise. These findings show that the construction of OC and OO helps to enhance the promotion of OOI on EG, while the implementation of OOI also helps to enhance the promotion of IOI on EG. In general, from the perspective of culture, structure and innovation matching, this article provides theoretical knowledge and practical implications for researchers and managers to better understand OI and EG, and how enterprises can better grow from OI.

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