

The Impact of Incubator Efficiency on the Performance of Incubated Enterprises: The Mediating Effect Test Based on Network Competence

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Abstracts

With the implementation of innovation-driven strategy and the rise of entrepreneurial economy, the number of new start-ups in China has shown a rapid growth trend. As an emerging economy, small and medium-sized enterprises play an active role in promoting national economic and social development, creating jobs, promoting scientific and technological innovation and stabilizing the overall social situation, which has important strategic significance. As an important part of the entrepreneurial ecosystem, incubator is a powerful tool and an important carrier for the survival and rapid development of start-ups. Based on resource dependence theory and social network theory, this paper constructs an integrated analysis framework of "incubator efficiency - network competence of incubated enterprises - performance of incubated enterprises" by establishing a causal model of incubator efficiency into incubated enterprises' performance, and conducts an empirical research on the impact of efficiency and performance between two closely related subjects in the incubation network. The research enriches the related theories of incubators, and has certain significance for improving incubator's incubation ability and effectively stimulating incubated enterprises' network competence.

Keywords: Incubator Efficiency; Network Competence; Performance of Incubated Enterprises

Introduction

In 1980s, the emergence of business incubators made more and more new start-ups get rid of the limitations of social networks at the individual level of entrepreneurs, and to draw social capital and resources by entering incubators and embedding in social networks, bringing a broader social network platform for inter-institutional cooperation and exchange. The economies of scale of incubators enable incubated enterprises to obtain shared or originally high resources at preferential prices, thus reducing the search for external resources and related indirect costs, and at the same time, the management support system and fiscal and taxation mediating services provided by incubators can be enjoyed. Incubated enterprises can focus on building and shaping the core competitiveness of enterprises without spending too much energy in daily affairs of enterprises. According to the *Report on China's Entrepreneurship Incubation Development in 2020* released by Torch High Technology Industry Development Center, Ministry of Science & Technology, by the end of 2019, there were 13,206 business incubation carriers in China, including 5,206 incubators, 8,000 creative spaces, 658,000 incubated enterprises and teams, 217,000 of which were incubated enterprises, and 49 science and technology innovation board enterprises cultivated by incubators. The incubator industry market showed a good trend of prosperous development, which became an important choice for many new start-ups. However, Numerous studies have shown that the massive growth of

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incubators has failed to bring about a simultaneous increase in the performance of incubated enterprises, and the real efficiency of incubators with technology incubation function has not yet been fully realized. In the process of development, incubators have experienced low efficiency in resource utilization, unreasonable resource allocation, unsound operation system, and single service function, resulting in an imbalance of "input-output" ratio of incubators, and the dilemma that scale expansion is out of sync with operation efficiency improvement. Based on the basis of resource-dependent theory and social network theory, the model of performance is constructed. Through the collection and empirical analysis of data samples of 160 incubated enterprises from 16 provinces and cities in China, the paper shows that the incubator network ability plays between incubator efficiency and the performance of incubated enterprises, and explores the dual relationship between incubators and new weak incubated enterprises.

Research Objective

The focus of this paper is whether the current dilemma of insignificant performance growth of incubated enterprises is influenced by the operation efficiency of incubators. What are its specific mechanisms of action? Is there a heterogeneous characteristic of its influence? There are two specific purposes:

1. Empirical research on the influencing factors between the two subject efficiency and performance in the incubation network to reveal the action mechanism of transforming the incubator operation efficiency into the performance of the incubated enterprises.
2. Reveal the formation mechanism of performance differences of incubated enterprises from the internal aspects of new enterprises, refine the research content of performance relations of network members in the field of innovation cluster, and help incubated enterprises to quickly pass the chaotic period of entrepreneurship.

Research Methodology

This research adopts both qualitative and quantitative methodologies. On the basis of theoretical analysis, it constructs a theoretical framework, puts forward research assumptions, and analyzes the data through empirical analysis. In the process of data analysis, modern statistical software is fully used to reasonably verify whether the assumptions are valid. Firstly, descriptive statistical analysis is used to understand and master the basic information of the survey data; secondly, the correlational analysis is used to understand the initial correlation between the research variables, which provides a preliminary explanation for the research hypothesis of this research; thirdly, reliability analysis and validity analysis are used to understand the validity and reliability of this questionnaire survey; fourthly, confirmatory factor analysis will be used to verify the rationality of the model constructed by the obtained survey data; finally, the paper uses linear regression analysis to test the research hypotheses proposed in this research, which provides demonstration and support for the research hypotheses proposed in this research.

Research Scope

Literature Review and Research Hypothesis

The Relationship between Incubator Efficiency and the Performance of Incubated Enterprise

"Efficiency" is the core content of economics, which refers to the ratio of the amount of labor consumed and the labor achievements obtained in the daily production of enterprises. Enterprises achieve organizational goals by effectively allocating scarce resources, efficiency pays attention to the resource allocation of organizations and systems, measures the effective utilization ability of resources of organizations and systems, focuses on the best ratio of system resource input and system output, and is a comprehensive evaluation of organization and system production process, which is also the efficiency of organizational process. The operation efficiency of incubator is the contrast between input and output in the operation process, which reflects the allocation effect of science and technology enterprise incubator on its resources, and reflects the incubator's ability to transform various input resources into cultivating small and medium-sized science and technology enterprises, creating and increasing employment opportunities and tax revenue. Because of the high business risk and high transaction cost, the failure rate of new start-ups remains high. Based on the social network theory, the micro-entrepreneurial ecosystem formed by incubator, as an advanced form of network organization, has unique advantages in promoting the growth of new start-ups. Incubated enterprises are able to quickly engage in organizational learning and innovation legitimization by embedding in networks, so as to obtain complementary professional resources and knowledge overflowing from related partners. By using the social capital obtained by incubating networks, their development opportunities and capabilities can be enhanced, and their incubating performance can be improved. Based on this, this research believes that the higher resource utilization of incubators will have an impact on the performance of incubated enterprises, and puts forward Hypothesis 1.

H1: Incubator efficiency has a positive impact on the performance of incubated enterprises.

The Mediating Effect of Network Competence

The concept of network competence was first put forward by Håkansson (1987 : 157-159) at the enterprise and organization level as the ability to improve its comprehensive network status and deal with specific network relationships, including the ability of enterprises to improve their network location and deal with a single relationship. Ritter and Gemuenden (2003 : 691-697) further expanded and deepened the concept of network competence as the ability of enterprises to initiate, maintain and use business networks to gain competitive advantage. Xu Jinfa et al. (2001 : 5) put forward that network competence is about the ability of enterprises to develop and manage external network relations, and its essence lies in obtaining competitive advantage by seeking and using network resources. In a word, the network competence of an enterprise is a kind of ability that the enterprise in the network actively manages its own network, optimizes the network relationship, and shapes the network vision and value, which has the attribute of network organization and management. Previous researches on the relationship between network competence and performance of organizations mainly focus on the theoretical level. In recent years, empirical researches have made considerable progress. It has been confirmed by most researchers that network competence has a positive impact on enterprise performance and competitive advantage. Not only do researchers believe that network competence has a direct impact on enterprise performance, but some of the researches have begun to analyze the mechanism of network competence on

enterprise performance (including mediating effect and moderating effect). In the research of dynamic capability, Zahra et al. (2006 : 917– 955) pointed out that, learning is the mediating variable from resource structure to substantive ability, while Xing Xiaoqiang and Tong Yunhuan (2006 : 6) believe that network competence is the dynamic capability of enterprises to obtain scarce resources and guide network changes by identifying network values and opportunities, shaping network knots, developing, maintaining and utilizing network relationships based on internal knowledge and other supplementary resources. Based on this, this research believes that network competence, as an mediating variable, has mediating effect in the process of transforming incubator efficiency into the performance of incubated enterprises, and puts forward Hypothesis 2.

H2: Network competence plays an intermediary role between incubator operation efficiency and entrepreneurial performance of incubated enterprises.

H2a: Network strategic competence plays an intermediary role between incubator efficiency and performance of incubated enterprises.

H2b: Network process competence plays an intermediary role between incubator efficiency and performance of incubated enterprises.

H3c: Network knowledge competence plays an intermediary role between incubator efficiency and performance of incubated enterprises.

H4d: Network relationship competence plays an intermediary role between incubator efficiency and performance of incubated enterprises.

The theoretical model is shown in Figure 1:

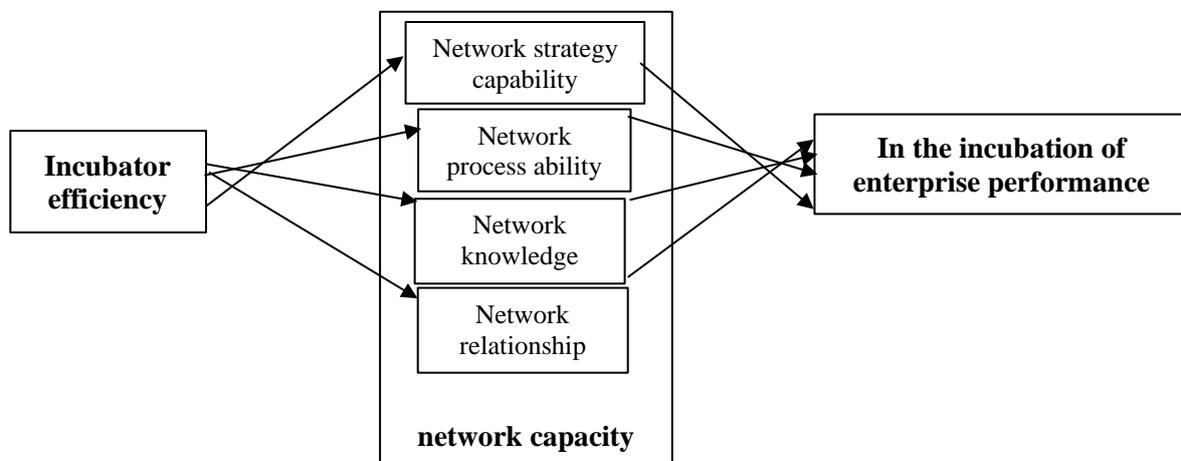


Fig. 1 Hypothesis Model Diagram of the Relationship between Incubator Efficiency and Performance of Incubated Enterprises

Variable Measurement

The design of this questionnaire is based on the literature summary and combing of incubator efficiency, performance of incubated enterprises and network competence in the early stage, and fully on relevant mature and widely used classic scales at home and abroad. Incubator operation efficiency variables are designed from two dimensions: input and output, mainly referring to the maturity scale of Dai Bibo et al. (2012 : 142-146). Among them, the input includes the total number of employees in the incubator, the total amount of incubation funds in the incubator, the investment in the public technology service platform and the area of the incubator site, including three items, while the output includes five items such as the

cumulative number of graduated enterprises, graduation rate and intellectual property rights of the incubator.

As for the measurement of network competence variables, this research mainly adopts Gao Liangmou et al. (2010 : 76) from the perspective of incubated enterprises and the market situation of China's incubating industry, that is, reconstructs the network competence of incubated enterprises from four dimensions: strategy, process, knowledge and relationship. Among them, network strategic competence is the ability of an organization to systematically evaluate the network situation and environment from the strategic dimension, find opportunities, resources and capabilities that are beneficial to its own development, and dynamically plan and change according to its own situation; network process competence is the network competence that organizations properly utilize from outside to inside, from inside to outside and bidirectional processes in the process of incubating network interaction, including from outside to inside, from inside to outside and bidirectional capabilities; network knowledge competence is a network competence to coordinate the distribution of internal and external knowledge in an organization to realize knowledge integration and decentralization balance; network relationship competence is the network competence to deal with opportunism, property rights, coordination and other issues arising from co-creation with other network members. There are 5 items in each of the four dimensions, with a total of 20 items.

The performance variables of incubated enterprises adopt subjective performance evaluation method. Combined with the research of Johan et al. (1999 : 37-48) and some scholars' researches, the performance of incubated enterprises is divided into three dimensions: survival performance, growth performance and innovation performance. Among them, survival performance is the reaction of the sustainable operation level of enterprises, including the return on net assets, profit rate and market share of incubated enterprises; growth performance is the response of enterprise expansion speed and growth potential, including three items: development speed of new products or services, market share and net return rate of incubated enterprises compared with competitors; innovation performance is the reaction of new products and new service concepts, including three items: the proportion of sales revenue of innovative products to total sales revenue, the number of new output development and the proportion of new products to total products.

Sample and Data Collection

The samples of this research come from different types of business incubators in 16 provinces and cities in China, and the relevant responsible persons take random sampling in the incubators under their jurisdiction to issue questionnaires. Due to the paired survey, 167 questionnaires were distributed to the top managers of 167 incubated enterprises in 16 provinces and cities. Finally, 160 available questionnaires were received in this research, and the ratio reached 95.80%.

Research Findings

Reliability and Validity Test

Cronbach's α coefficient is mainly used to judge the overall reliability of the scale, and the following results can be obtained by testing the SPSS questions. The overall reliability value, **Cronbach Alpha**, of the questionnaire is 0.921, and the overall reliability of the questionnaire meets the test standard of the scale.

In the measurement of internal consistency of the questionnaire, factor analysis through SPSS, KMO value is 0.843, the validity value is greater than the test standard of 0.8, and both Bartlett spherical test and KMO measure pass, so the validity of the questionnaire in this study can be considered reasonable.

In the bias test of the common method of data, SPSS is used to test the data of the questionnaire, and the test results show that the factor extracted this time accounts for 25.23%, which is less than the single factor test standard of 40%. The data results demonstrate that there are no serious common method biases.

Main Effect Test

The regression coefficient of incubator operating efficiency is 0.201 ($t=3.122$, $p=0.002 < 0.01$), which means that incubator operation efficiency will have a significant positive impact on the entrepreneurial performance of incubated enterprises. H1 holds.

Mediating Effect Test

The mediating effect verification of this research is carried out three steps. The first step is to test whether the independent variable incubator efficiency has a significant impact on the dependent variable performance of incubated enterprises, if there is a significant impact, continue to the second step of the test; then, to test whether the independent variable incubator efficiency has a significant impact on the mediating variable network power, and whether the mediating variable network power has a significant impact on the dependent variable performance of incubated enterprises, and then carry out the third step test if both have a significant impact; the third step is regression analysis of independent variable incubator efficiency and mediating variable network power to dependent variable enterprise performance. If the regression coefficient of mediating variable network power to dependent variable enterprise performance is significant, and the regression coefficient of independent variable incubator efficiency to dependent variable enterprise performance is not significant, it can indicate that the network power of mediating variable plays a complete mediating effect between independent variable and dependent variable; if the regression coefficient of mediating variable network power to dependent variable enterprise performance is significant, the regression coefficient of independent variable incubator efficiency to variable enterprise performance is still significant but decreased, which shows that the mediating variable network power plays a partial mediating effect between independent variable and dependent variable.

Mediating Effect Model Test

	Performance of incubated enterprises	Network competence	Performance of incubated enterprises
Constant	3.753** (104.200)	3.830** (114.562)	0.267 (1.541)
Incubator efficiency	0.201** (3.122)	0.158** (2.568)	0.056 (1.534)
Network competence			0.912** (21.092)

Mediating Effect Model Test

	Performance of incubated enterprises	Network competence	Performance of incubated enterprises
Sample size	180	180	180
R ²	0.044	0.034	0.686
Adjusted R ²	0.040	0.030	0.683
F-value	F(1,206)=9.890,p=0.002	F(1,206)=7.460,p=0.006	F(2,202)=229.256,p=0.000

Note: N=160 * p < 0.05 ** p < 0.01 The t-value is in brackets

Regression analysis of incubator efficiency variables on the performance of incubated enterprises shows that the data in Model 1 has a significant positive impact. Secondly, regression analysis of independent variables and mediating variable network competence shows that the regression coefficient is 0.158, which has a significant positive impact. Then the independent variables and mediating variables and enterprise performance at the same time for regression analysis, we can get the results of operational efficiency of the significant disappearance, network competence is significant, the regression coefficient is 0.912. The data show that incubator efficiency affects the performance of incubated enterprises through network competence. It is concluded that network competence plays a complete mediating effect in the relationship between incubator efficiency and performance of incubated enterprises.

Regression Analysis of Refined Indicators

Independent variable	Dependent variable	Normalization coefficient	t	p	VIF	R ²	Adjusted R ²	F
Network strategic competence		0.221	2.548	0.012*	3.258			
Network process competence		0.309	3.362	0.001**	3.411			
Network knowledge competence	Financial performance	0.213	2.530	0.021*	2.852	0.455	0.460	F (4,189)=47.287,p=0.000
Network relationship competence		-0.008	-0.081	0.941	3.131			
Network strategic competence		0.233	3.138	0.003**	3.247			
Network process competence		0.098	1.249	0.214	3.407			
Network knowledge competence	Growth performance	0.189	2.648	0.089**	2.844	0.631	0.633	F (4,189)=83.544,p=0.000
Network relationship		0.327	4.354	0.000**	3.128			

competence								
Network strategic competence		0.125	1.549	0.127	3.258			
Network process competence		0.305	3.707	0.000**	3.401			
Network knowledge competence	Innovation performance	0.216	2.722	0.068**	2.846	0.55	0.550	F (4,189)=65.779,p=0.000
Network relationship competence		0.171	2.033	0.044*	3.129			

Note: N=160 * p<0.05 ** p<0.01

The four dimensions of network competence, "network strategic competence, network process competence, network knowledge competence and network relationship competence", are taken as independent variables, while the three dimensions of enterprise performance, "financial performance, growth performance and innovation performance", are taken as dependent variables for linear regression analysis. It can be seen from the above table that network competence has the greatest impact on growth performance, followed by innovation performance and less impact on financial performance. Among them, network knowledge competence has significant effect on three dimensions of enterprise performance, while network relationship competence has no significant effect on financial performance, network process competence has no significant effect on growth performance, and network strategic competence has no significant effect on innovation performance. In addition, the multicollinearity test of the model shows that all the VIF values in the model are less than 5, which means that there is no collinearity problem.

Conclusion

In this research, the efficiency of 160 incubators and the performance of incubated enterprises are taken as the research objects for data collection, on that basis of social network theory and resource dependence theory, the dynamic capability theory is introduced, which is combined with incubator theory. In the binary relationship interaction between incubator and incubated enterprises, this research analyzes the unbalanced interaction of different levels of subjects, constructs the influence mechanism model of incubator at the social network level, empirically discusses the influencing factors and path mechanism of performance between incubator and incubated enterprises, and reveals the unequal binary relationship between incubator with concentrated resources and new weak incubated enterprises. The results of the empirical research shows that there is a significant and positive relationship between incubator efficiency and the network competence and performance of incubated enterprises, incubator efficiency has a significant positive impact on the performance of incubated enterprises. The network competence and performance of incubated enterprises also have a significant positive effect on each other; the network competence of incubated enterprises plays a mediating role in the relationship between incubator efficiency and performance of incubated enterprises. It can be seen that incubator efficiency is an important external factor affecting the growth of

incubating new start-ups, and the network competence of incubated enterprises has a positive impact on their performance.

The number	Hypothesis the description	Hypothesis the test
H1	Incubator operation efficiency pair ofIn the incubation of enterprise performanceHas a positive effect	support
H2	networkabilityIt plays an intermediary role between the incubator operation efficiency and the entrepreneurial performance of the incubated enterprises	support
H2a	networkStrategic abilityIt mediates between the incubator efficiency and the performance of the incubated enterprises	support
H2b	networkProcess abilityIt mediates between the incubator efficiency and the performance of the incubated enterprises	support
H3c	Network knowledge abilityIt mediates between the incubator efficiency and the performance of the incubated enterprises	support
H4d	Network relationship abilityIt mediates between the incubator efficiency and the performance of the incubated enterprises	support

Discussion

1. Positive impact of incubator operation efficiency on the performance of incubated enterprises

The study shows that the incubator operation efficiency has a positive impact on the performance of the incubated enterprises. At present, profound changes have been taken place in the incubator industry. Although there are still problems such as low operation efficiency and unreasonable resource allocation, it can be seen from the research results that the essential function of incubators to support innovation and incubating new small enterprises has not changed, and the operation efficiency of incubators has a positive impact on the entrepreneurial performance of incubated enterprises. The innovation network built with incubators as the core subjects can provide incubated enterprises with external resources such as information and capital needed for innovation, realize the technical exchange between innovation network subjects, enable incubated enterprises to obtain incubation services in the sense of economy of scale, and reduce start-up costs and save transaction costs.

2. Network capabilities play an intermediary role between incubators and incubated enterprises

Studies have shown, As a kind of learning ability, network ability will promote the performance of incubated enterprises from the level of resource acquisition and absorption. With the implementation of network capabilities, incubated enterprises can create relational assets in the process of incubation network relationships built by incubators, and promote mutual knowledge interaction in common learning ways, so as to realize

complementary capabilities. Network capability promotes the optimization and expansion of the incubation network from the aspects of network strategy, process, knowledge and relationship construction, consolidation and quality improvement, and affects its own entrepreneurial process.

Theoretical Recommendations

This research proposes an integrated framework for analyzing the performance relationship between entrepreneurial incubators and incubated enterprises, and reveals the path of entrepreneurial incubator efficiency through the role of network competence on incubated enterprise performance through empirical research, which helps to reveal the formation mechanism of enterprise performance differences within start-ups, refine the research content of the relationship between network competence in the innovation cluster field and the performance of network members, and develop the theoretical research on the performance of start-ups in the context of entrepreneurial incubators.

Policy Recommendations

The conclusion of this research shows that the incubator industry has undergone profound changes at present. Although there are some phenomena such as low utilization rate of resources and imbalance of "input-output" ratio, the essential functions of incubators in promoting the transformation of scientific and technological achievements, supporting innovation and incubating new small enterprises have not changed, and the efficiency of incubators has a positive and positive impact on the performance of incubated enterprises. Therefore, incubator remains an important production organization form for cultivating innovative enterprises, improving the efficiency of incubators will act a crucial role in the development of new start-ups. New start-ups get the opportunity to establish connections with more related nodes through embedding in the social network platform built by incubators. After becoming an incubated enterprise, it should actively build its own network system, cultivate network strategic competence, network knowledge competence, network process competence and network relationship competence, and lay a resource foundation for the future development of the enterprise. The improvement of network competence will not only have a positive impact on enterprise performance, but also help optimize the structural position of the enterprise in the social network.

Practical Recommendations

This research mainly explores the influence mechanism and effect of incubators and incubated enterprises at the organization level from the perspectives of social network theory, resource dependence theory and dynamic capability theory, although it provides some glimpses into causes affecting the performance of incubators and incubated enterprises. In fact, a deep understanding of the causes for the performance of incubated enterprises not only helps the rapid growth of start-ups, but also provides theoretical guidance for incubators to improve their incubation efficiency. At present, this topic has not been discussed in previous researches. Therefore, future research can explore the impact of organizational innovation atmosphere and other factors on the performance of incubated enterprises from the perspective of organizational behavior theory, and provide important practical guidance for the selection of innovation platforms for incubated enterprises.

References

- Hakansson H. Industrial Technological Development: A Network Approach[J]. *International Journal of Research in Marketing*, 1987. 4 (2), 157-159.
- Ritter, T. , & Gemuenden, H. G. . (2003). Interorganizational relationships and networks: an overview. *Journal of Business Research*. 56 (9), 691-697.
- Xu Jinfan, Xu Qiang, & Wang Yong. (2001). Analysis of Network Competence of Enterprises. *Foreign Economies & Management*. 23 (11), 5.
- Zahra, S.A., Sapienza, H.J., & Davidsson, P. (2006). Entrepreneurship and dynamic capabilities:A review model and research agenda. *Journal of Management Studies*. 43, 917– 955.
- Xing Xiaoqiang, Tong Yunhuan.(2006). Network competence: concept, structure and influential factors. *Studies in Science of Science*. 24 (A02), 6.
- Dai Bibo, Sun Dongsheng. (2012). Study on the Performance of Enterprise Incubator Based on DEA Method---Taking 14 National Enterprise Incubators of Northeastern China as an Example. *Science & Technology Progress and Policy* . (01), 142-146.
- Gao liangmou, Yun Jiang, & Ma Wenjia. (2010). Research on A Network Capability Framework in Open Innovation. *Economic Management* (12),
- Wiklund, J. (1999). The sustainability of the entrepreneurial orientation—performance relationship. *Entrepreneurship Theory and Practice*. 24 (1), 37-48.