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Research on Incubation Performance Influence Factors of China Information Technology Business Incubators with Grounded Theory

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Abstract: Five selected China IT business incubators are studied with grounded theory, after coding the interview data, we establish the model of influence factors that affect IT business incubator's incubation performance with dimensions of the external factor, the internal factor and the associated factor. The external factors that affect the incubation performance are institution and industry environment, the internal factors are network operation ability, capability of incubating service and organization system protection, the associated factor is entrepreneurship of incubated enterprises.

Keywords: information technology, incubation, influence factors, grounded theory, performance

1. INTRODUCTION

With the advent of the Internet age, information technology has become an important driving force of the social development and economic growth of all countries. China regards information technology as one of the seven strategic emerging technology industries, but when compared with developed countries, there is a certain gap in information technology level. In the "2013 Global Information Technology Report (GITR)" released by the World Economic Forum, China's information technology level listed only 58 in 144 countries and regions [1].

Today, many information technology business incubators are built in order to promote the development of China's IT industry, However, because of China's information technology business incubator started late, both in theoretical research or practice level is obviously insufficient. Compared with the technology incubator in other fields, information technology incubator is normally in the creative development stage, whose hatching success rate is low and investment and marketing costs are getting higher and higher. It is necessary to explore of the information technology incubator business incubator performance influence factors.

2. LITERATURE REVIEW

2.1 Performance of business incubators

Most foreign researches on the performance of business incubators adopt qualitative analysis and case study. Roberts et al. evaluated the performance of business incubators in the US state of Idaho with case study, which argued that the development path of business incubators in different regions is different. Evaluating the performance of business incubators in the same region can promote regional incubator competition [2]. Chan and Lau proposed a framework of evaluation of technology business incubator with the qualitative analysis, including resource centralization, resource sharing, public image, management consulting, public image, network platform, agglomeration effect, cost advantage, and financing support as index. They also studied 6 start-ups of Hong Kong Science Park to verify its effectiveness [3]. Study abroad generally use a large number of survey data or system research methods. Sung et al. studied 121 incubating and graduated enterprises of 7 business incubators in the South Korean city of Daejeon. They built "linear model" and "non-linear model" to evaluate business incubators with analysis of the data collected in the survey[4] . Colombo and Delmastro studied the performance difference of 45 incubating enterprises and 45 non-incubating enterprises in Italy to measure the actual performance of the incubators. The study is illustrated that the input-output ratio of both types of

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enterprises is very close [5].

2.2 Study on the influencing factors of incubator

The scholars have obtained many achievements on the influencing factors of business incubator, we illustrate in Table 1.

Many scholars have studied the influence factors of incubating ability, operation efficiency and incubation effect of business incubator, many different theory models have been put forward, the influencing factors are most be divided into external factors and internal factors. But the influencing factors of specific types of incubators for the information technology industry are still lack of in-depth research. Business incubator in China has its unique properties and background, so the research should be carried out in the unique background and environment. In our understanding, it is necessary to identify the factors affecting the performance of information technology business incubators from concrete practices in China.

Table 1. The research results of influencing factors of business incubator

Researcher	Research result
Lalkaka, Bishop (1997)	The paper analyzed the influencing factors for the performance of business incubators in developing countries, which argued the main influencing factors are financial support, infrastructure, system analysis of the cost, enterprise hatching condition, business tracking, financing channels and national policy and so on [6].
Pedro Oliveira el. (2002)	According to analysis of the influence of Internet on the service enterprise, the paper argued the main factors influencing service ability, service quality and corporate earnings are the knowledge capital, structural capital and absorptive capacity of enterprise [7].
Lois Peters, Mark Rice (2004)	From the perspective of graduation rate of incubated enterprises, the paper analyzed the influencing factors for the performance of business incubators, which noted incubator infrastructure, training and network resources are the main factors and reduced transaction costs, the increase of learning opportunities and policy are also the important factors for improving the graduation rate [8].
Xu lingjuan, Liu Ninghui (2008)	Using principal component analysis, this paper found the external environment of business incubator, the operation ability of business incubator, the development ability of business incubator, the innovation capability of business incubator and the incubated business are the main influencing factors [9].
Zhou Dongfeng (2010)	The paper divided influencing factors of business incubators into external factors and internal factors and did analysis from political, economic, social, technological, environmental and legal 6 aspects using PESTEL model. The internal factors included the capacity and quality of the management team, the mode of the incubator, incubator funds, and the relationship between the incubator and the incubated enterprises [10].
Li Wenbo (2012)	The paper makes an exploratory study on the influencing factors of knowledge service innovation of business incubator in the city of Hangzhou with grounded theory and builds ODPN model including knowledge operation capability, knowledge networking capability, knowledge service demand and innovation of guarantee mechanism [11].

3. ANALYSIS OF THE INFLUENCING FACTORS FOR THE PERFORMANCE OF INFORMATION TECHNOLOGY INCUBATOR

3.1 Grounded theory

Grounded theory is one kind of qualitative research method based on the data to find the clue and has the typical theoretical exploration function [12]. Through qualitative research to observe the real situation of information technology business incubator and the incubated business, the paper builds the theoretical model of influence factors close to information technology business incubators' status using grounded theory to analyze the influencing factors (Figure1).

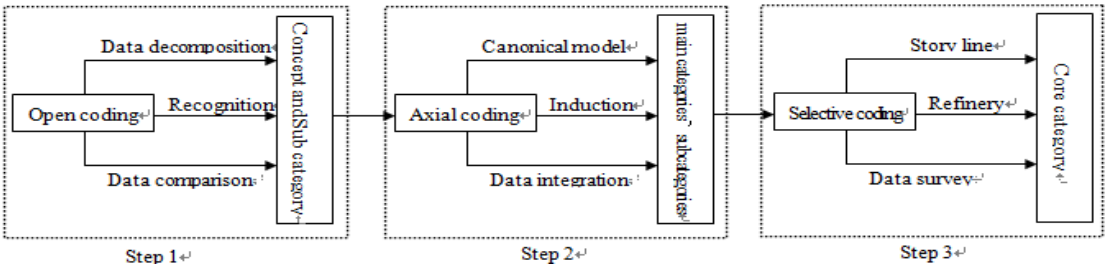

Figure 1. Routinization coding analysis steps of grounded theory [11]

3.2 Data Collection

Sampling requirements of grounded theory is theoretical sampling and emphasizes the purposive sampling rather than random sampling. It requires samples should have certain representativeness and provide the maximum amount of information [13]. We select one better incubation performance national incubator A and one bad performance national incubator B as the research objects. Then according to the analysis of incubator A and B's data, select one non-national business incubator C. Because its performance of incubator is closely related to incubated business, two information technology startups D and E as the interview objects also are selected. To sum up, we have finally interviewed five units including one national university science park, one national innovation service center, one private enterprise incubators and 2 start-ups of high-tech business of information technology, three of which are information technology business incubators or incubators whose incubated business are mostly information technology business. The interview persons are senior management with many years of incubator service experience, and each interview time is about 60-110 minutes.

3.3 Data analysis

3.3.1 Open coding

Open coding means to disintegrate the original data, analyze the data word by word by comparing events and between events and concepts constantly, and form the category and subcategories [14]. After each investigation, the interview data are dispersed structure. Combined with the literature and the relevant experts' exploration and comparing data, concepts and subcategories, finally 162 key statements are got. By combining some repetitive initial concept and deleting some initial concepts with low frequency, 94 initial concepts are got. After refining 21 subcategories are finally received. The part of open coding is illustrated in Table 2.

Table 2. A part of open coding

Subcategories	Initial concept	Original statement
Intellectual property	Intellectual-property protection	China does not pay much attention to intellectual property rights, a good product is just come out, BAT will copy it.
	Technology of plagiarism	Repeat, imitation, plagiarism, many domestic enterprises are in the low and repetitive stage.
Network quality	Quality of cooperation	If schools are not closely related to the enterprise and the incubator, it would not much help.
	Technical cooperation	Through the communication with the college, can reflect the enterprise's demand to the school, it contributes to the realization of technology upgrading and product improvement.
Professional services	Hosting service	Provide hosting service. Enterprises only need to focus on core areas. Other administrative, human, financial all have standardized services. Advocacy hosting services.
	Promotional services	In terms of sales, the government can provide help in a certain extent. For example, held a road show at regular intervals. Open to small enterprises and show and spread for all walks of life.
System	Evaluation standard	Lack of experts in relevant fields. No clear evaluation criteria of the project.

	Enterprise evaluation	Incubate the legality and growth potential of incubated business.
Market promotion	Operation and marketing	Information technology companies lack the operational and marketing personnel, Because the technology implementation is relatively easy, but difficultly sell it.
	User research	It's promising to comply with the consumer psychology, entertainment psychological and behavioral habits.
Business management	Business model	Clicks and Mortar doesn't work. Start from service and find a suitable business model.
	Enterprise system	How to establish modern enterprise system? Govern company with system, instead of persons.

3.3.2 Axial coding

Axial coding is to establish the association between different categories obtained in open coding with clustering analysis. Strauss and Corbin suggested applying the paradigm model, including causal conditions, theoretical phenomenon, context, intervening condition, action-interaction strategy, action results as the reference frame in analysis and link the categories in open coding together [15].

Three main categories and six minor categories are acquired with the paradigm model through repeated comparison between concepts and categories in the open coding and comprehensive consideration of the relationship between categories (Table 3).

Table 3. Main category and minor category formed by axial coding

Main category	Minor category	Corresponding subcategory	Concept of category
External factor	Policy system	Policy orientation	Incubator positioning, goal setting and the supporting policies for small and medium-sized enterprises
		Technology management	Operation of incubator governance structure, technology oriented and science and technology management level affects the government itself
		Industry matching	Incubator industry positioning is consistent with local industry positioning which can promote the incubation performance.
		Entrepreneurship support	Funding for incubators and start-ups and business security will influence the success rate of entrepreneurship.
	Industry environment	Entrepreneurial environment	Information technology industry business difficult, industry foundation and funding etc
		Industrial characteristics	The information technology industry has characteristics of changing quickly, high risk and immature industry which lower hatching success rate.
		Intellectual property	The protection of intellectual property rights forms the technical barriers to trade which reduces competition.
Internal factors	Network operation ability	Network quality	Incubator connected by the organization and its effective performance of cooperative behavior increase the incubators' external support.
		Network size	The number of incubator connecting the internal and external organization associates with the variety and quantity of services provided by the incubator.
		Network strength	The close degree of "industry-university-institute" cooperation and degree with finance institutions is closely related to the quality of service provided by the incubator
	Incubator service capability	Professional services	Professional diagnosis, management consulting, resource integration, business planning, technology incubation, market development etc.
		Service quality	Whether the actual effect of the provided services achieve the desired goal reflects the performance of service.
		Public service	Openness and sharing, information management platform, public

			technology platform, business coaching and training, knowledge sharing, communication and so on.
		Management level	The quality and ability of management, the incubator operation management and Internal communication.
	Organizational guarantee system	Qrganizational orientation	Incubator’s own properties and orientation, the service object target
		Operation mode	Providing the high quality service for the incubated enterprises can forms stable architecture which can promote the normal operation of incubator.
		System	Hatching system, incubation system, the hatch system, the project evaluation system
Associated factors	Incubated enterprises’ entrepreneurship	Technological innovation	The technical level and the innovation ability of incubating enterprises are the foundation of information technology enterprise.
		Market promotion	In order to meet customer needs and achieve the goal of the enterprise, launching a product on to the market directly affects the income of the enterprise and survivability
		Human resources	Enterprise can have a management mechanism helping enterprises to create value.
		Business management	According to the competition environment, policy and own situation enterprises develop internal management of the present stage and planning for the future.

We can conclude from the Table 3 as follows: (1) Factors affecting the performance of information technology business incubator are the fractal dimension, which can be divided into external factors, internal factors and associated factors. (2) External factors are mainly from the government's policies and systems as well as IT industry environment which is difficult to be controlled by the incubator itself, but indirect impact on hatching performance. (3) Internal factors can be divided into incubator network operations, incubation service ability and organization system. The three aspects interrelated and constitute the incubator's internal operation system affecting the hatching performance. Associated factors are generally less mentioned in the literature, which derived from incubated enterprise which has close relationship with the incubator performance. Incubators' purpose is to improve entrepreneurial ability of the incubated business which reflects the incubator hatching performance.

3.3.3 Selective coding

Selective coding is to aggregate all categories from the open coding and axial coding to the core category, verifying their relationship, and the complete the category without complete conceptualization. Through the analysis with 21 subcategories, 6 minor categories and 3 main categories, the theoretical model of influencing factors of information technology incubators combining with the interactive comparison and discussion of the original record is illustrated in Figure 2.

In our understanding: (1) The incubation performance of information technology incubators is core category. Focusing on implied relationship between the core category, the main category, and subcategory, the incubation performance of information technology incubators is affected by the overall impact of external factors, internal factors and associated factors. (2) The scenes around the core category are as follows: Policy system and industry environment as the external factors generate external effects for the incubator and incubated business. On this basis, the internal factors of incubator will affect associated factors (entrepreneurship of incubated enterprises), and associated factors directly affect the incubator performance. (3) Network operation ability, capability of incubating service and organization system protection as internal factors interact and affect each other, which has a overall an impact for the entrepreneurship of incubated enterprises. (4) The entrepreneurship of incubated enterprises directly impacts the incubation performance. Incubators need help the

incubated enterprises to improve entrepreneurship with the help of the outside world and through own efforts.

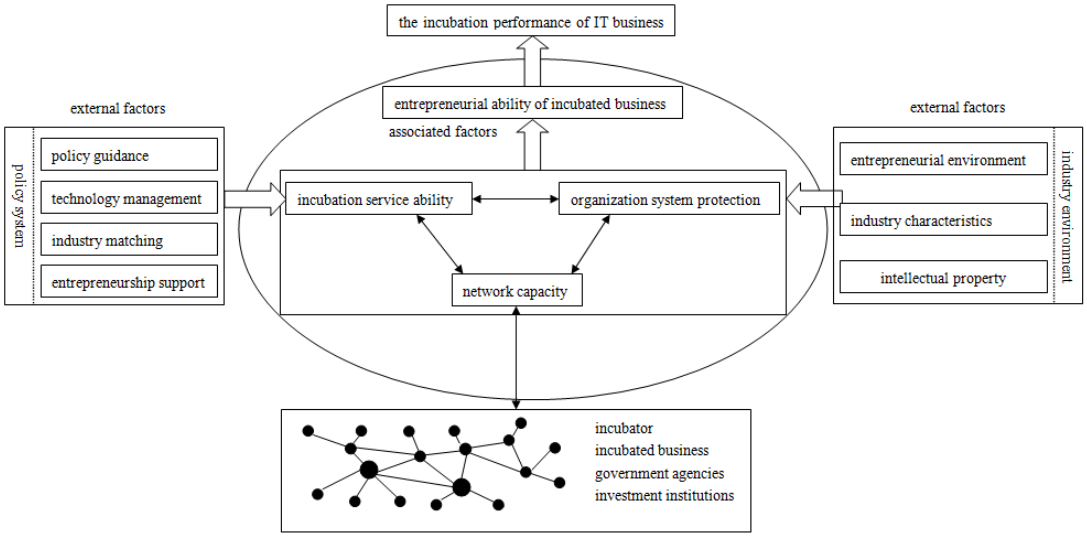

Figure 2. The influencing factor model of IT business incubator's incubation performance

4. CONCLUSIONS

The overall incubation performance of IT business incubators in China is low. The main reason is that the use and configuration of IT business incubators' investment resources is inefficient. The information technology business incubator need condense professional coach team, strengthen the use of funds and technology platform, and expand the business scope to increase revenue, foster more startups and improve enterprise innovation ability.

The influencing factor model of IT business incubator's incubation performance, which shows the influencing factor and its work way, is established with grounded theory. The IT business incubator is mainly affected by external factors, internal factors and associated factors. The external factors that affect the incubation performance are institution and industry environment, the internal factors are network operation ability, capability of incubating service and organization system protection, the associated factor is entrepreneurship of incubated enterprises. External factors can effect on internal factors and associated factors. Internal factors directly affect the correlation factors, and associated factors act directly on the incubation performance.

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The influencing factor model of IT business incubator's incubation performance is established mainly based on the IT companies in Guangdong, it should be taken further research and exploration to see its universal.

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