Factors Influencing Investments in High-tech Start-ups: An Analysis Based on Grounded Theory

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Abstract. As an important driver of enterprise innovation and development, venture capital firms have a considerable impact on the healthy and sustainable development of enterprises and the commercialisation of research findings. This thesis aims to find ways to make enterprises efficiently obtain investments from venture capital firms to achieve high-quality development. In particular, this study focuses on the factors influencing investment in high-tech start-ups and uses programmatic grounded theory to build a fishbone diagram model of these factors. The results indicate that there are five key factors influencing investments in high-tech start-ups: investor preferences, market prospects, enterprise characteristics, team abilities and financial considerations, which can then be subdivided into 14 subfactors. Specific to high-tech start-ups, this thesis focuses on the investment preferences of venture capital firms by studying and analysing the key influencing factors to help Chinese high-tech start-ups improve their investment and financing efficiency. This study also aims to provide a theoretical reference to expedite the construction of an innovative China, strengthen support for the innovation of small- and medium-sized start-ups and promote the commercialisation of research findings.

Keywords: Venture Capital; Grounded Theory; Fishbone Diagram Model.

1 Introduction

Unlike ordinary enterprises, high-tech start-ups have to go through the stage of technology research and development (R&D) as well as the stage of product marketisation from the start-up to the mature phases. At each stage, they pursue different goals and face different risks. For example, at the R&D stage, the main purpose of high-tech start-ups is to develop and improve technology. They need to invest a considerable amount of money in technology R&D and face numerous technical and financial risks. At the stage of product marketisation, enterprises focus on transforming technology into products to promote and expand the market while simultaneously preparing for the development of new technologies. The risks faced by enterprises at this stage are mainly market risks. In addition, most start-ups have no products or can only produce a small number of new products, making it impossible to accurately predict whether the products will withstand the market, which in turn, will affect an enterprise's income.

Generally, high-tech start-ups are characterised by high investments, high risks, high returns and long cycles. High-tech start-ups require huge funds to meet the needs of technology R&D, which usually has a long cycle. Once the technology is developed and successfully commercialised, it can bring huge benefits because of its originality and uniqueness.

2   Literature Review

Since Premier Li Keqiang first proposed the slogan 'widespread entrepreneurship and innovation' at the Summer Davos Forum in September 2014, innovation and entrepreneurship have also gradually become popular in China. However, high-tech start-ups generally require massive funds for development, so their financing has become a hot issue in academic circles. For example, Li (2016)[1] performed an empirical analysis of the factors of entrepreneurial success, including team, project and geographical factors, from the perspective of the enterprise. They found that compared with the academic background, the founder's continuous entrepreneurial and work experiences in related fields make financing easier. Their results also showed that regional factors tend to have an insignificant effect on start-up financing. Xiang, Lou and Wang (2019)[2] first introduced qualitative analysis in the field of start-up financing feasibility analysis and proceeded to build a configuration model. Aside from obtaining four reliable configuration paths, they also found that the characteristics of entrepreneurial teams, innovation of business models and features of social networks have configurative effects on the availability of start-up financing. Unlike previous studies on financing availability that focussed more on social networks, their study demonstrated the diversity of entrepreneurial teams and the configurative effect of business model innovation on start-up financing.

Start-ups usually consist of small- and medium-sized enterprises (SMEs). Thus, given that their small scale is one of the causes of their financing difficulties, studies on the financing problems faced by start-ups typically focus on the financing difficulties and measures implemented by SMEs in China. For example, adopting the government's perspective, Lv Jinsong (2015) [3]found that solving the financing difficulties of SMEs entails improving the institutional financing environment, building a multilevel financial market system and expediting the establishment of a credit investigation and enhancement system for SMEs. Wang and Mu (2019) [4]combined the background of economic shifts to examine the effects of the development of small- and medium-sized banks on the financing constraints faced by SMEs under government intervention. According to the study, the development of small- and medium-sized banks can alleviate the financing constraints of SMEs; however, such an improvement is not significant in areas with strong government intervention.

Using the cash–cash flow sensitivity model, Yao and Dong (2015) [5]concluded that compared with financial development level, financial structure can better alleviate the financing constraints of SMEs; furthermore, small- and medium-sized banks should

play an important role in an optimal financial structure. Lu Qiang, Liu Beini and Song (2019)[6] investigated the topic from the perspective of SMEs and used enterprise ability theory to build a theoretical model. Their proposed model explains how SMEs choose the supply chain financing solution that affects financing performance in supply chain finance. Using research data collected from a questionnaire survey administered to enterprise representatives from Jiangsu, Zhejiang and Shanghai, Zhou Zhongsheng, Luo Zhengying and Duan Shu (2015)[7] explored the credit financing constraints of SMEs, arguing that the information-sharing mechanism alleviated the credit financing constraints of SMEs through network embedding. Furthermore, they found that compared with large banks, the relationship between SMEs and small- and medium-sized banks has a greater effect on the mechanism of network embedding, alleviating credit financing constraints. Therefore, the structural embedding status of SMEs should receive more attention from small- and medium-sized banks.

Shen Chen (2017) [8]studied the financing efficiency of SMEs in NEEQ based on calculation and analysis via the three-stage DEA model, concluding that enterprise scale is the main factor affecting the financing efficiency of SMEs in NEEQ. Shen also found that most SMEs have low-scale efficiency. In particular, the majority of SMEs in NEEQ are in the stage of increasing returns to scale, with large demands for funds and small variation in terms of pure technical efficiency. Li Jianjun and Zhou Shuyuan (2019)[9] used data from an effective questionnaire survey on enterprises in Beijing-Tianjin-Hebei, Jiangsu-Zhejiang-Shanghai and Guangdong and found that SMEs are significantly more financially excluded than large enterprises. Furthermore, the differences in the financial literacy of senior management between large enterprises and SMEs also reflect the financial literacy of their respective senior executives.

The characteristics of start-up companies have a significant impact on venture capital institutions' project screening. However, according to the research results of Petkova et al. (2013)[10], if start-ups want to obtain venture capital investment, it is necessary to actively present oneself to the outside world, thereby enhancing their perceived value in the hearts of venture capitalists to obtain the potential venture capital. It is noteworthy that Bertoni et al. (2016)[11]insisted not all start-ups are in a passive position. Potential and outstanding start-ups have the freedom to choose venture capital, however, the excellent characteristics of those start-up companies play initial role while the venture capital institutions make the decision .The research results of Wiklund et al. (2009)[12] show that investors who have graduated from the college of the science and engineering and experienced in entrepreneurial business, are more interested in investing in A start-up enterprise.

3   Research Design

3.1   Methodology

In the field of venture capital, research on influencing factors is still in its infancy. Mature theories have not yet been produced, and literature reviews are largely unable to comprehensively and effectively include all possible influencing factors. Therefore, in this thesis, the interview-grounded method is used to encode the factors affecting

the empowerment efficiency in the interview data and extract the conditional variables of the qualitative comparative analysis method.

Grounded theory is a qualitative research method. When this method is used for research, researchers tend to have no theoretical hypothesis at the beginning but collect data specific to a certain phenomenon without being affected by their subjective experiences. After the analysis of the original collected data, researchers systematically classify relevant concepts and identify those that reflect the social phenomena being investigated. The theoretical framework is gradually formed based on the connections among these concepts, and finally, the theory is formed. The application of this theory consists of the following steps: open coding, axial coding and selective coding.

Open coding is the first and most important stage of grounded theory. It is necessary to decompose and analyse related data (such as the collected interview information and internal documents), gather and classify similar concepts, and discover the category to which they belong. The specific operation is as follows: first, the data are analysed, and the sentences related to the research content are extracted and conceptualised ('conceptualisation' of data); second, similar concepts are centralised, and higher-level concepts are extracted ('categorisation' of concepts); third, the categories are labelled; and fourth, the nature of the categories are mined, and the dimensions are identified.

Axial coding is needed to explore the main categories, establish the connection between categories, reclassify the categories after analysing the logical order and mutual relationships among them and summarise the main categories accordingly. This stage is a continuation and deepening of the first stage. Grounded theory uses canonical models to complete the relationships among categories derived from open coding. Canonical models mainly include causality, phenomenon, context, intermediary conditions, action relationship and result.

Selective coding is the final stage of the coding process, and its main tasks are to explore the core category from the universal categories and continuously shift the focus of research to the coding related to the core category. The steps of selective coding are as follows: first, the core category is developed, the dominant core category is identified (has strong explanatory power and high abstractness), and the core category is related to other categories; second, the storyline is clarified, the categories and relationships are mined from the collected data and the case data obtained or observed from the entire interview are displayed; third, all the collected data are used to verify the relationships among the categories; and fourth, the category is improved to form the process framework.

3.2   Data Collection

In this thesis, semistructured and unstructured interviews are used. Semistructured interviews are more flexible than general interviews. The manner and order of questions can be adjusted, in which some questions can be temporarily added or deleted according to the actual situation of the interview. Before the formal interview, it is necessary to formulate a hypothesis for the problem to be studied and design a corre-

sponding interview outline based on the relevant literature to ensure the smooth progress

The main methods of data collection performed in this thesis are as follows: first, the researcher participated in an internship. During the six-month internship in the interviewee's company, the researcher contacted the project head, participated in the project seminar and actively participated in the investment project. Second, the researcher reviewed the relevant literature. This thesis refers to a large number of relevant Chinese and foreign literature. Then, it analysed and summarised the literature to determine what needs to be improved. Finally, the gathered ideas are combined with the opinions of experts and the researcher's own views to lay the theoretical foundation for this thesis.

The two investment managers interviewed in this thesis both came from the second-level subsidiary of Group C, a leading investment enterprise in Hubei Province. Founded on 25 January 2022, Group C focuses on the national strategy and construction of modern industrial clusters in Hubei Province, fulfilling the provincial-level functions of strategic emerging industry investment operations and industrial investment fund management. Rooted in Hubei, the Group promotes the green development of the Yangtze River Economic Belt and improves the energy and quantity level of industrial development in Hubei. The Group supports the incubation of high-tech enterprises, the development of leading enterprises and the landing of major industrial projects with a particular focus on the six major industrial sectors, namely new-generation information technology, biomedicine, new energy, modern industry, ecoenvironment protection and automobiles and parts. With a registered capital of RMB 33.6 billion and total assets of RMB 223.2 billion, the Group has 17 second-level subsidiaries and 9,800 employees. The interviewees each have more than 10 years of investment experience.

3.3   Innovations

This study expands the scope of key factors influencing venture capital projects. Combined with the interview content, this study analyses the differences between industries in key influencing factors; conducts an in-depth analysis of the influence scope of investor preference, market prospects, financial considerations, enterprise characteristics and team ability; and improves the key influencing factors for venture capital projects.

Interview analysis and exploration of key influencing factors.

3.4   Open Coding of Interview Data

After performing open coding, The results are shown in Table 1, the following 16 categories were obtained: A01 investor type, A02 profiting method, A03 industry of enterprise, A04 industry growth, A05 business valuation, A06 stage of enterprise, A07 team, A08 enterprise features, A09 sales model, A10 business model, A11 financial data, A12 fund security, A13 investment purpose, A14 product, A15 industry judgement and A16 macroeconomy.

Table 1. Results of Open coding of interview data

Open coding	
Conceptualisation	Categorisation
a00 Moneymaking	A01 Investor type (a01, a02, a03, a38
a01 Classification of investors	and a43)
a02 Marketisation	A02 Profiting method (a04, a05, a17,
a03 Policy type	a18 and a45)
a04 IPO exit	A03 Industry of enterprise (a06, a07,
a05Enterprisegrowth and profitability	a11, a12, a15, a16, a59, a60, a61 and
a06 Internet new consumption	a62)
a07 Traditional manufacturing	A04 Industry growth (a08, a09, a10, a13
a08 Revenue scale	and a14)
a09 Profit growth	A05 Business valuation (a17, a18 and
a10 High growth of industry	a22)
a11 White home appliance	A06 Stage of enterprise (a19, a20, a30,
a12 Environmental protection	a31 and a49)
a13 Red sea	A07 Team (a25, a26, a27, a28, a29, a63,
a14 Blue sea	a64, a65, a66, a67, a68 and a69)
a15New energy vehicle	A08 Enterprise features (a32 and a33)
a16 Photovoltaics	A09 Sales model (a35)
a17 Expensive project	A10 Business model (a36)
a18 High profitability	A11 Financial data (a70, a71, a72 and
a19 Junior enterprise	a73)
a20 Scale enterprise	A12 Fund security (a40, a41 and a42)
a21 Business valuation	A13 Investment purpose (a00 and a44)
a22 Inversion	A14 Product (a34, a46 and a47)
a23 Auto parts enterprise	A15 Industry judgement (a48, a54, a55,
a24 Team	a56, a57 and a58)
a25 Successful experience	A16 Macro economy (a50, a51, a52 and
a26 Executive force	a53)
a27 Team background	
a28 Technical background	
a29 Channel	
a30 Initial stage of enterprise	
a31 Certain scale of enterprise	
a32 Organisational structure	
a33 Upstream and downstream relationship of the industrial chain	
a34 Product a35 Sales model	
a36 Business model	
a37 Financial data	
a38 Political investor	
a39 Security a40 Recoverable funds	
a41 Repo capability	
a42 Terms	

a43 Attractive investment	
a44 Industries move in from outside the province	
a45 Replacing allocation with investment	
a46 Moat	
a47 Whether the product can be certified by the customer	
a48 Industry growth rate	
a49 Home appliance industry	
a50 Macro economy	
a51 Peripheral market	
a52 US interest rate hike	
a53 Weak demand	
a54 Fast-growing industry	
a55 Difficult development	
a56 Mutual replacement	
a57 Low-growth industry	
a58 Six emerging industries	
a59 New energya60 New material	
a61 Biotechnologya62 Real estate	
a63 Luo Yonghao-style team	
a64 University team	
a65 Market expansion	
a66 Service spirit	
a67 Knowledge of operation , management and market	
a68 Knowledge of capital operation	
a69Ambitions and willingness to gamble	
a70 Financial data	
a71 Useless financial data of start-ups	
a72 Revenue growth	
a73 Net profit scale	

3.5   Axial Coding of the Interview Data

After conducting axial coding on the interview data, five categories were obtained, as shown in Table 2.

Table 2. Results of Axial coding of the interview data

Main category	Category number	Category name
Investor preference	A01, A02, A12 and A13	Investor type Profiting method Investment purpose Fund security
Market prospect	A03, A04, A15 and A16	Industry of enterprise Industry growth Industry judgement Macroeconomy
Enterprise characteristic	A05, A06, A08, A09, A10 and A14	Business valuation Stage of enterprise Enterprise features Sales model Business model Product level
Team ability	A07	Team background Funder characteristics
Financial consideration	A11	Revenue growth Net profit scale

3.6   Selective Coding of Interview Data and Model Building

Table 3. Results of Selective coding of interview data

Main category	Basic description
Investor preference	Investor preference is the first microfactor influencing the choice of start-up venture capital project.
Market prospect	Market prospect is the second microfactor influencing the choice of start-up venture capital project.
Enterprise characteristic	Enterprise characteristic is the third microfactor influencing the choice of start-up venture capital project.
Team ability	Team ability is the fourth microfactor influencing the choice of start-up venture capital project.
Financial consideration	Financial consideration is the fifth microfactor influencing the choice of start-up venture capital project.

By conducting selective coding on the conclusions derived from axial coding, five core categories were obtained, as shown in Table 3. Compared to the categories presented in Table 2, the categories in Table 3 are more comprehensive and interconnected.

Using data regarding investor preference, market prospect, team ability, enterprise characteristics and financial consideration, a fishbone diagram model is built comprising the key factors influencing the choice of start-up venture capital projects, as shown in Figure 1.
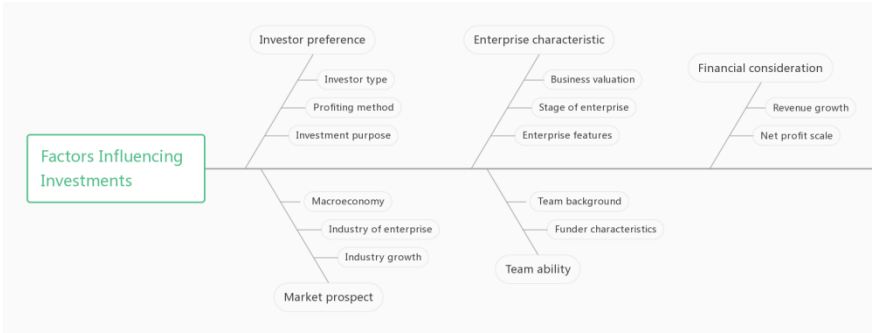
Fig. 1. The fishbone diagram model for key factors in the selection of venture capital projects during the initial stage of a startup.

3.7   Theoretical Saturation Test

To ensure a scientific and rigorous theoretical model, this thesis includes a theoretical saturation test, which is a benchmark to measure whether to stop sampling for the grounded theory. As more new data are encoded, these lead to the discovery of new theories, concepts and categories. Otherwise, it means that the theory has reached saturation. Therefore, D, another investment manager, was interviewed.

By coding and analysing the interview of D, we further confirm that the industries of start-ups and the types of investors have varying degrees of influence on the choice of start-up venture capital projects. Furthermore, the codes failed to produce new categories, new attributes of categories and new elements that differ from those found in existing categories. Thus, based on such results, the above coding categories and influencing factors are theoretically saturated.

4   Conclusions and Deficiencies

4.1   Conclusions

Many factors affect investments in start-ups, but the key factors can be classified into market prospects at the macro level and enterprise characteristics, team ability, financial consideration and investor preference at the micro level. Both macro and micro key factors influence the choice of start-up project, and some cross-correlations exist between factors. The five main categories correspond to a total of 16 subcategories that reflect the secondary influencing factors contained in each main category. In general, the start-ups preferred by different investors tend to vary, but risk is consistently valued, while growth is the most valued among all other factors. From a micro point of view, the team can best reflect the growth of a start-up, and when a company reaches a certain scale, the management level can better reflect the company's growth. From a macro point of view, the development prospect of the industry can best reflect a company's growth, which is mainly judged through the industry growth

rate. Furthermore, financial data can also be used to verify the growth of an enterprise.

4.2   Deficiencies

One limitation of this work is the manner in which the case enterprise is selected. First, the interviewees selected in this thesis are both from a large-scale state-owned enterprise. Thus, even if failure cases are added to the theoretical saturation test, there may still be survivor bias in the conclusions. Second, the interviewees are from the same company, and other investors are not selected for comparative analysis. These factors may have inevitably affected the representativeness of the conclusions to a certain extent.

In terms of the research method used, grounding theory is a qualitative research method that is limited by its use of programmatic coding. Thus, the research results must be combined with empirical analysis for further testing.

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