ISSN : 0974 - 7435 Volume 10 Issue 7

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(7), 2014 [1853-1858]

Factor Analysis of scientists' start-up stage

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ABSTRACT

This paper adopts the method of case study to deeply analyze the evolution process and key factors of the scientists venture in China, and explore the key factors in the process of technology innovation and entrepreneurship. Studies have shown that scientists becoming entrepreneurs is a new way of entrepreneurship of emerging industry in China. The venture factors displayed at the different stages of scientists' start-up are the key to entrepreneurship success, according to the typical enterprise of scientists venture, in this paper the enterprise growth process is divided into creative stage, starting stage, growth stage and prosperity stage, from which the elements scientists should have in every startup stage are abstracted: talent resources, science and technology resources, pioneering consciousness, pioneering spirit, following the business policy environment, looking for entrepreneurial opportunities, establishing patent strategy and business model, etc. Through factor analysis, this paper is expected to provide helpful enlightenment for the success of scientists' start-up.

KEYWORDS

Start-up stage; Entrepreneurial elements; Emerging industries.

INTRODUCTION

Active innovative and entrepreneurial activity is one of the important factors to promote the development of new industries. At present, there have been some corresponding research on innovation activities of the emerging industry, but the study on entrepreneurship of emerging industries is relatively less. There are different characteristics of entrepreneurial activities in different industries. For biology, nano, a new generation of information technology industries these strategic emerging industries, entrepreneurial activities mainly centre on scientists, different elements are required in the different stages of enterprise growth. Successful entrepreneurs can't depart from the support of specific elements, and due to the particularity of the scientists, this kind of key elements of the entrepreneurial activity are different from that of general entrepreneurial activity. This paper adopts a typical case study method, taking China's Beijing zhongke recruiting printing technology co., LTD. (later referred to as "zhongke recruiting") as an example to explore elements of scientists'start-up[1]stage, which helps to promote the development of biology, nano and a new generation of information industries these emerging industries, especially provide direct reference for entrepreneurship of relevant industries in China.

STUDY DESIGN

Variable definition

Scientists' start-ups still follow the enterprise growth process in life cycle theory of the business, the domestic and foreign scholars have divided the start-up stages. For example: Based on enterprise scale, Chen Jiagui divided the growth of enterprise into: enterprise incubation period, the survival period, high-speed growth period, mature period, decline period and transformation period[2]; According to the criteria of enterprise sales, Li Ye divided the enterprise into: incubation period, the neonatal period, growth period, mature period and decline period[3]; Eric argued that the company scale (measured by revenues) determined the enterprise's development stage, the enterprise is respectively divided into newly created stage, expansion stage, professional stage, consolidate stage, diversified stage, integration stage and decline and recovery phase[4]; Gereina believed that the process of growth of the enterprise can be divided into five stages: start-up stage, collectivization stage, standardization stage, refinement stage and cooperation stage[5]; Lawrence divided growth process of small enterprises into direct control stage, command and management stage, indirect control stage and stage of departmentalization organization[6].

Obviously, the division of the start-up stage is not unified, this paper divides start-up stage into creative stage, start-up stage, growth stage and prosperity stage. Specific content as follows:

1) Creative stage

This is the stage that scientists find commercially valuable scientific research. The quality of scientific discovery is the key to this stage, the higher the quality of scientific discovery is, the greater mining potential is, and the value will be higher after being put on market.

2) Start-up stage

This is the stage that scientists start up a new enterprise. First, scientists are becoming entrepreneurs; Second, solve the problem of intellectual property rights, and construct the corresponding business model; Finally, pay attention to technology patent protection.

3) Growth stage

This is the stage that some enterprises start to diversify, and establish the whole industry chain structure; Some enterprises annex small enterprises to meet the need of expansion. The business model constructed early should be examined by entrepreneurs at this stage, and strategic planning should be made.

4) Prosperity stage

The enterprise has been on the right track at this stage, scientists may not be good at management, scientists need to take a back seat in time right now, hire professional managers, establish a perfect system of organization, and plan the future development of the enterprise.

Study method and case selection

Case study is based on the case and produces theory from the study, the generation of theory completely rooted in and sublimated in the case or the relationship among the constructs of cases and the logic arguments behind the relationships[7]. Multi-case study has more advantages in terms of effectiveness and universality, but single case study is more suitable for in-depth analysis, and can explain complex phenomenon[8]. In this paper, considering the in-depth analysis and interpretation of the phenomenon of the successful scientists' entrepreneurship, single case study is adopted. Case selection requires typicality and extreme situation, and has a unique research value[9]. Depending on the research of nano-materials green plate making and its application, Zhongke recruiting becomes the leading printing company, the chairman Song Yanlin is a famous scientist of new materials laboratory in Institute of Chemistry, Chinese Academy of Sciences, his research field of nanometer materials green printing is an important emerging industry. Therefore, taking CST recruiting as the research object has typical significance.

The data source

Case study commonly uses data sources, including documents, records, interviews, direct observation, participatory observation and physical evidence[10], we first obtain preliminary data from the open channels of industry information, event reports and profile, on the basis of this, by accessing Zhongke recruiting company's official website, as well as telephone, email and interviews from division within the company and related professionals in the field of recruiting, further data is obtained, after repeated examination, the basic material for case is determined. In the process of data collection, triangle validation method is used to identify the quality of the data, triangle validation method refers to the researchers reduce the effects of bias by multiple sources of evidence and multiple research methods[11]. But due to various reasons, we failed to conduct the interview with Song Yanlin, which may cause certain influence on the depth of research. But because relevant information has been fully collected as far as possible, so we think that the existing data can better ensure the quality of research.

CASE ANALYSIS

According to the enterprise life cycle theory and the present situation of the development of Zhongke recruiting company, the development process of Zhongke recruiting company is divided into four stages.

The creative stage

Printing industry has important influence on our national economy, it is also one of the "heavy pollution" industries. Throughout the entire printing industry chain, pollutions mainly embody in three aspects: waste liquid, waste gas and waste residue pollution. Nano-materials green plate-making technology developed by Chinese Academy of Sciences can solve the problem of the three major pollutions[12]. Its principle is that plank of plate making has hydrophilic property, which makes it won't get oily on the cartridge, and images and text are displayed on print area in the future, using the oil-wet (easy to ink adhesion) nano-materials to print onto hydrophilic plate, thus, plate without being coated oil-wet nano-materials presents the blank area of print in the future. The area on the plate coated with oil wet material is the text and images after printing. The principle of the technology, comparing the photographic imaging principles in widely applied laser typesetting technology and off-line direct plate-making (CTP) technology, avoids the photosensitive, imaging and flushing these complicated processes, reduces the cumbersome process of avoiding light operation process, solves the problem of waste liquid

pollution in the process of plate making, reduces the cumbersome process, and reduces the cost. In addition, Zhongke recruiting company adopts the green concept of replacing oily ink with water-based ink, which reduces the emissions of volatile organic compounds (VOC)of ink, and solves the problem of waste gas pollution. With the continuous extension of the business, Song Yanlin team conquers the nano printing process based on the "plastic base" to replace the aluminum version base preparation, which abandons a large amount of waste residue produced by neutralization of metal ions of aluminum and limestone, and solves the waste pollution problem.

The green plate-making technology developed by scientist Song Yanlin at this time has"led"the world, it needs to have the spirit of "pioneer". However, the traditional Chinese the doctrine of the mean thought and the backwardness of science and technology in the past century, make scientists not confident in the technology they research and develop by themselves, they are used to ask: "who study abroad?" Therefore, surmounting psychological barrier, and developing technology with the mentality of "to be the first", the strategic innovation of Song Yanlin has changed the past wrong ideas of depending on foreign technology.

The author thinks that this phase is at the stage of scientists' innovation theory, there is still large distance compared with creating an entity enterprise, entrepreneurs are focusing on market information and searching significant scientific discovery from personal network resources. As to whether there is an opportunity, what kind of business model, how to form a entrepreneurial team, whether to start a business, these questions can't be answered. But entrepreneurs have enough confidence in their scientific discoveries, so a sign of crossing creative period for entrepreneurs is that the direction of the business and the target market are generally determined.

The foregoing analysis shows that, at this stage, scientists need to have the following entrepreneurial elements: 1) human resources; 2) science and technology resources; 3) entrepreneurial consciousness (business consciousness); 4) entrepreneurship.

Start-up stage

Venture in China not only needs to solve technical problems, business problem, but also needs to have a profound understanding the whole society and national conditions and development trends. Scientists' scientific research belongs to public knowledge, its property rights shall be owned by the state. If raising private capital will involve the emergence of the phenomenon such as loss of state-owned assets. Therefore, Song Yanlin attends the "star of lenovo" entrepreneurial activity, attracts the investment of state-owned enterprises, and makes state own the share of the company. Zhongke recruiting uses "system start-up" way to solve the problem of the intellectual property ownership. At the same time, the problem of the venture capital is solved. In addition, Zhongke recruiting also needs to establish patent strategy planning, seize the main clue of the technology innovation, on the basis of the early applied patent, patent of process, formula, equipment and products should be comprehensively mined and protected, especially patent layout for a long-term should be planned to expand market share of innovative technology in the field of printing[13].

At the start-up stage, scientists mainly have entrepreneurial spirit and entrepreneurial ability, under the existing business policy environment, they should seize every possible opportunity, establish patent strategy planning, construct the business model matching the state-owned enterprise, and put research result into market and verify its commercial value by using the resources of state-owned enterprises.

The foregoing analysis shows that, at this stage, scientists are required to have these entrepreneurial elements: 1) entrepreneurial ability; 2) following the business policy environment; 3) looking for entrepreneurial opportunities; 4) establishing patent strategic planning; 5) establishing a business model.

Growth stage

A demonstration line has been built in Institute of Chemistry, Chinese Academy of Sciences, including: plate-making workshop, super clean coating workshop and the cartridge production

workshop, greatly promoting the industrialization of the technology of nano-materials green plate-making. Zhongke recruiting is based on the industry, with nano-materials as core technology of emerging industry, to solve the pollution problem of production link in other industries. Zhongke recruiting breaks through paper printing category, extends the nano green printing technology to electronics, building materials, printing and dyeing and other industries, through innovation and application of nano-materials, solves the problems of environmental pollution and high energy consumption in the industries above, and reduces the production cost at the same time. Finally, a "nano-materials green technology printing industry cluster"is formed. We can say that as long as there is the need of design, the printing technology developed by Zhongke recruiting can be used.

At entrepreneurial growth stage, the core technology of the start-ups has been launched on the market, and brand resource is formed. Enterprises need to further examine the correctness of business model, at the same time, scientific research breakthroughs of the core technology of startups should be explored to establish a comprehensive strategic planning.

The foregoing analysis shows that, at this stage, scientists are required to have the following entrepreneurial elements: 1) examining business model; 2) scientific research breakthrough; 3) the strategic planning.

Prosperity stage

When the technology development and pilot of Zhongke recruiting come to a conclusion, the development of enterprise relies more on industry and business operations at the later stage, Song Yanlin made a big decision, and invited professional manager Chen yong as chief executive officer (CEO) of Zhongke recruiting. He took a back seat, and became the chief scientist and chief technology officer (CTO) of his company. The biggest advantage for scientists to become entrepreneurs is that scientists have a better understanding of the application of scientific research results and the potential of achievement breakthrough. But when "technique" transforms into "product", "product" transforms into "goods", the only thing need to do is to implement mass production and effective business operations, obviously, as a scientist Song Yanlin is not good at management, after realizing the dream of scientists' successful entrepreneurship, he was willing to take a back seat, handed over the Zhongke recruiting to more professional person to manage. This wise choice makes Zhongke recruiting lead the advanced technology in the world, and perfect management mechanism of enterprise, which is of great significance to the development of Zhongke recruiting in the future.

At prosperity stage, the spirit of entrepreneurial scientists is willing to take a back seat, sacrifice personal interests and honor for the long-term development of the enterprise, step back to professional management talents, establish a sound management system, and organize and plan the company's future development. This kind of scientist's state is worth to be learned by all entrepreneurial scientists.

The foregoing analysis shows that, at this stage, scientists are required to have the following entrepreneurial elements: 1) the entrepreneurial scientists' spirit; 2) looking for professional management personnel.

CONCLUSIONS AND IMPLICATIONS

Combining with the case study method, this paper clearly expounds the elements scientists should have at the different start-up stages, from which we can draw the following enlightenment: first, the key factor of scientists' successful start-ups is to create the strategic innovation technology that leads the world; Second, scientists should have enough confidence in the technology developed by themselves, and be willing to take a back seat; Third, scientists should follow the policy guidance, and flexibly use the system reform to solve the problem of public intellectual property; Fourth, the scientists should build a comprehensive patent strategy planning, and expand the market share of technology innovation. Of course, in this paper, the adoption of the single case contributes to the further study of the complex phenomena, but at the same time, it is not universal, cross case analysis need to be done to research the extension of conclusions.

ACKNOWLEDGMENTS

This research is supported by National Natural Science Foundation of China (71372121), Ministry of education of humanities and social science research project fund plan project (13YJA630031), Ministry of education of humanities and social science research youth fund projects (12YJC630102), Institutions of higher learning in liaoning province talents support program (WJQ2012006), Liaoning university of science and technology innovation team building project (2012TD02).

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