CORPORATE SPIN-OFF COMPANIES WITHIN THE CHINESE BIOTECHNOLOGY INDUSTRY

WORK-IN-PROGRESS

Åse Linné

Uppsala STS, Uppsala University

Ase.Linne@sts.uu.se

Introduction

All over the world there is an increased attention towards new high-tech companies spun out of established organizations such as universities, research institutes and established companies. With the introduction of new spin-offs from established organizations industrial change can come about. Spin-off companies are seen as an important part of the contemporary business landscape and the spin-offs are not only contributing to economic growth but also technological process and employment opportunities etc. (Zahra et al. 2007). The context of the parent organization is viewed as an important determinant in the direction of the spin-off (Parhankangas & Arenius, 2003; Lindholm Dahlstrand, 2006; Zahra et al. 2007). This means that spin-offs originating from universities, referred to as university spin-offs (USOs), differ compared to spin-offs originating from an existing company, a so called corporate spin-off companies (CSOs) (Wennberg et al. 2011; Clarysse et al. 2011). For instance USOs tend to develop products based on radical technologies while CSOs tend to develop products based on established technologies (Zahra et al. 2007). In investigating high-tech companies USOs get the most attention from scholars, while research on CSOs are somewhat neglected (Parhankangas & Arenius, 2003; Lindholm Dahlstrand, 2006; Ito & Rose 1994; Ito 1995). However some researchers have pointed to the fact that CSOs display better growth and survival rate than companies spun out of universities and (Wennberg et al 2011; Clarysse et al 2011). This calls for more studies investigating the conditions for formation of CSOs and their business activities.

The increased attention towards high-tech spin-off companies is not only limited to the western industrialized world but is also a fact in contemporary China. The Chinese government has since the "open-door policy" issued in 1978 emphasized the importance of establishing spin-off companies to ensure future economic growth and global competitiveness (The State Council, 2006). In line with this the Chinese government has pointed out seven strategically important high-tech industries to guide Chinas future economic growth and thus establishment of spin-off companies within these industries are encouraged and supported. Moreover the Chinese government has issued several policies encouraging universities and research institutes and existing companies to establish spin-off companies of their own (Gu 1994). To spur the establishment of new companies, start-ups and spin-offs the Chinese government has established several economic zones along with more than 50 science parks all over China since the late-1980s (Liu et al. 2011). Today thousands of companies are located in these parks and economic zones, a majority of these being high-tech spin-offs. Although the number of spin-offs has increased in China research focusing on Chinese spin-off companies are still scarce, existing research mainly investigates the establishment and development of spin-offs originating from universities and research institutes (Xie & White 2004; Kroll & Leifner 2008; Lu 2002; Hu & Mathews 2008; Liu & Jiang 2001; Gu 1996, Yang & Zou 2003; Liu & Lu, 2007). Research on investigating conditions for Chinese spin-offs originating from established companies is scarce. As a consequence this paper specifically investigates the formation of spin-off companies originating from established firms in a Chinese context.

We depart from the industrial network approach with the notion that any company or spin-off is dependent on a number of relationships in order to establish its business (Håkansson 1987; Håkansson & Snehota 1995). Spin-off research especially emphasizes the critical relationship between the spin-off and its parent organization and its impact on the spin-off (Zahra et al. 2007). Moreover high-tech spin-offs are dependent on technological or scientific knowledge (Clarysse et al. 2011) and thus the relationship to the technical source also needs to be investigated along with its impact on development of the spin-off. We use a Chinese corporate spin-off company within the biotech sector as our main unit of analysis and we discuss its formation and development through these two key relationships; the relationship between the CSO and the parent organization and the relationship between the CSO and the technical source. By investigating the relationships we aim to answer the following research questions:

What resources are developed within the relationship between the Chinese CSO and the parent organization and how does the relationship effect the development of the CSO?

What resources are developed within the relationship between the Chinese CSO and the technical source and how does the relationship effect the development of the CSO?

How is the Chinese entrepreneurial context affecting the formation of the Chinese CSO?

Theory

Relationships as a key resource to access critical resources for spin-offs

One characteristic of any new company including spin-offs is the need to gain access to resources in being able to develop its business further. Several scholars have pointed out that the establishment and development of relationships are important means of acquiring necessary resources for the development of new companies (Ciabuschi et al., 2012; Anderson et al., 2010; Hoang & Antoncic, 2003; Aaboen et al. 2013). The company is thus dependent on establishing long-term relationships to a number of organizations such as suppliers, customers, government agencies, users, research institutes, company departments etc. in order to establish its business (Ciabuschi et al. 2012; Anderson et al. 2010; Ito & Rose 1994). Having this in mind it is easy to understand why relationships to other organizations can be seen as a company's most valuable resource (Håkansson 1987). This also means that relationships constitute the basis for any spin-off and will direct its future growth (La Rocca et al. 2013; Håkansson & Waluszewski 2007). In being able to establish relationships with other organizations companies need to have the "capability to interact" (Ciabuschi et al., 2012:227), that means that the company have the ability to exchange, adapt and combine resources with other organizations. Interaction is therefore a prerequisite in establishing relationships (Håkansson, 1982). Gadde et al. (2012) investigates the establishment of new business relationships and its effect on resource development and emphasize the importance of using established relationships when initiating new relationships, hence through established relationships the spin-off can connect to other organizations crucial for the development of the company. This reflects that the establishment of spin-offs is far from an isolated phenomenon or as Ciabuschi et al. (2012: 226) puts it: "new business formation is the *collective enacting* of a business opportunity".

With the above argument we need to investigate how the spin-off company develops key relationships. As discussed through relationships resources can be exchanged, developed and adapted and thus by analyze the resource interaction taking place within key relationships we can understand the development of the spin-off companies. By using a resource interaction approach (Håkansson & Waluszewski 2002) we can understand how the spin-off is developed as an organizational unit in relation to other resources. We can categorize resources into technical resources (related to physical artifacts such as products and facilities) and organizational resources (related to social artifacts such as relationships and other units) (Håkansson & Waluszewski 2002; Baraldi 2003). When investigating key relationships to the spin-off company we can understand what resource exchange takes place within the relationships, how the resources are developed both organizationally and technically and how resource development affect the formation and development of the spin-off company. In the next section we focus our attention towards discussing critical relationships for spin-off companies further.

Key relationships of high -tech spin-offs

As Wallin & Lindholm Dahlstrand (2006: 611) point out: "Spin-offs are a special case as they form link from the old structure to the new" therefore spin-off companies can be characterized as organizations 'in-between' an established company and new company. Spin-off companies already have established relationships to a parent organization with an established resource structure and do not establish its business from scratch (Wallin & Lindholm Dahlstrand 2006). The established resource structure of the parent organization can act as a buffer for new spin-off firms since it can provide legitimacy, financing, development projects, access to users, administration and routines etc. (Wallin & Lindholm Dahlstrand 2006; Parhankangas & Arenius 2003; Clarysse et al., 2011). In turn the spin-off can provide the parent organization with a diversification of its core business and thereby reduce uncertainty in relation to experimentation of new technologies, markets, products etc. (Ito & Rose 1994; Ito 1995).

Recent research on spin-off companies discuss two main types of spin-offs; one being a spin-off spun out of university or research institutes, a university spin-off (USO), while the other being a spin-off originating from an existing company, a corporate spin-off (CSO) (Parhankangas & Arenius, 2003; Wallin & Lindholm Dahlstrand 2006; Wennberg et al. 2011; Mustar et al 2006). A majority of the spin-off studies have been investigating USOs, while less attention has been paid to investigate the formation of CSOs (Wallin & Lindholm Dahlstrand 2006), especially in high-tech sectors. Established organizations and existing firms are sources of new companies in high-tech industries, and companies originating from established companies have a greater possibility to survive compared to companies originating from research institutes and universities (Wennberg et al. 2011).

Panhankangas & Arenius (2003) conclude that CSOs can be divided into three different groups with different characteristics in regards to the relationship with the parent organization. The new technology group refers to companies that develop new technologies; these firms are often involved in developing products based on science that are far from actual commercialization. In this group normally the technology origin is external to the parent organization and the spin-off is created in order to diversify the core business of the parent organization. Due to the fact that the technology is not developed by the parent organization the spin-off interacts frequently with external research institutes or universities. The management team of the spin-off company can work rather independently of the parent organization. Within these types of companies the parent organization keeps shares in the new spin-off company, so called "sponsored" spin-offs (Wallin & Lindholm Dahlstrand 2006), but also open up for new types of investments such as venture capital. The interaction between the CSO and the parent organization increases when the CSO approaches product launch, hence increased integration and control is exercised by the parent organization. The second group of companies is the new market group referring to companies that develop products based on existing technology within the parent organization but the products are aimed at other markets. Here the CSO is strongly integrated with internal R&D units belonging to the parent organization and in many cases the parent organization becomes the main customer of the CSO. The third group of companies refers to as the restructuring group. These spin-off companies are focusing on restructuring old core businesses of the parent organization and a lot of resource exchange and interaction with other units of the parent organization takes place. Old business areas were spun-off into separate CSOs as the parent organization decides to renew its business and these spin-offs enjoy lot of autonomy in relation to the parent organization. Panhankangas & Arenius (2003) also discusses the critical relationship between the spin-off and its parent company, and focuses on the complementarily of resources that the two parties possess. The authors argue that if the resources are complementary the more interaction will take place between the CSO and the parent company and the other way around. Thus complementary resources increase sharing of resources between the parties after spinning-off the new venture. In line with the argument above we need to investigate the critical relationship between the parent organization and the CSO in order to understand the formation and development of the spin-off.

Since this paper discuss the formation of CSOs in a high-tech setting, namely the Chinese biotech sector, it is also important to pay attention to another key relationship of the spin-off company, the relationship with the technology source, i.e. the organization that developed the basic technology of the spin-off company (Clarysse et al. 2011). High-tech firms are often based on scientific knowledge and spin-offs originating from companies are in many ways initiated due to explorative activities outside of the parent organization such as research activities at research departments and universities (Clarysse et al. 2011; Panhankangas & Arenius 2003). In understanding the development of the CSOs in a high-tech environment we need to investigate how resource interaction takes place in relation to the technical source in charge of developing the technology and in what way this affects the CSO. In the following section we will provide a short review of research related spin-off companies in China, to give a short backdrop to exiting research on Chinese spin-off companies.

Research related to Chinese spin-offs

In spite of the general lack of empirical studies of spin-offs and new business formation in the Chinese high-tech industries (Yang & Li 2008) there are some interesting studies, mainly taking place within the computer industry. These studies are however only focused at understanding the establishment and development of university spin-offs (USOs). For instance the in-depth and longitudinal study of Chinas four largest computer companies by Lu and Lazonick (Lu, 2000; Lu & Lazonick, 2001; Lazonick, 2004) point to some interesting results concerning new companies within high-tech sectors in China. According to the studies the companies have evolved through the help of the established science and technology system in China including its established research institutes. The large computer companies are all spin-offs from large state-owned research institutes, and the interaction between the companies and the research organizations have been crucial in developing the companies and its products. Lazonick (2004) mentions the role of "patient capital" in China, i.e. long-term financing from the government as an important dimension in being able to develop spin-off companies from research institutes and universities. In the case of the Chinese computer company Levono Xie & White (2004) conclude that the USO developed stepwise and used the parent organization in creating legitimacy along taking advantage of the parent organizations' technical expertise. Other researchers (Tzeng et al. 2011; Li and Atuahene-Gima 2001) also put forward the importance of the government along with research institutes in establishing new firms within the computer industry. Tzeng et al. (2011: 446) especially mention the Chinese government as having "multitudes of roles" in high-tech development and the government encourages R&D activities within research institutes to be commercialized by spin-off companies. The study of university spin-offs in China by Kroll & Leifner (2008) conclude that universities and research institutes are highly involved in developing, financing and commercializing new scientific discoveries in China. Moreover Liefner et al (2006) explicitly focus on the connection between research institutes and Chinese biotech and high-tech companies. The authors emphasize that Chinese research institutes display many ties to Chinese companies, however the authors mentions that the research lack the investigation of what these ties contain. Eun et al. (2006) conclude that the parent organization of Chinese USOs takes direct control over the spin-off and determines the direction of the spin-off.

Summary of theoretical discussion

This short literature review of spin-offs in China clearly reveals the lack of studies related to spin-offs originating from exiting firms in Chinese high-tech sectors. However in order to understand the establishment and development of Chinese corporate spin-off companies we need to have the spin-off as our unit of analysis. We need to analyze the formation of the spin-off by investigating key relationships to the CSO. Two key relationships were pointed out in the theoretical discussion; the relationship between the spin-off company and the parent organization along with the relationship between the spin-off company and its technical source. In analyzing the relationships we will focus on investigating resource interaction taking place within the relationships and how it affects the formation, direction and development of the corporate spin-off.

Method

The study uses a case study approach in understanding the establishment and development of CSO companies in China. We use this approach since we focus on investigating critical relationships related to the new CSO. In understanding relationships with its interaction processes a qualitative case study approach is suitable (Dubois & Gadde, 2002; Easton, 1995). This paper is based on a larger case study of biotechnology in China and the case study presented in this paper is empirical data related to one CSO within the biotechnology industry in China. The company was selected to give a general picture on how Chinese CSOs establish and develop relationships in order establish its business.

The main data collection was performed between 2004 and 2007. The primary data collection consists of a total of 19 interviews. Seven interviews were performed with respondents employed in the CSO; these respondents were all in managerial positions such as the general manager, the production manager, and the separation managers. Another four interviews was performed with employees at GE Healthcare in China. The company is the main equipment supplier of the spin-off company and the respondents have all been involved in supplying the company with lab- and production equipment and therefore have detailed information of the company and its development process. Moreover another eight interviews was performed in China with respondents having deep knowledge of the Chinese biotechnology context in general. For instance we interviewed a Professor as Chinese Academy of Science (CAS), a general manager of a Chinese contract service organization, a CEO of an American consultancy firm focusing on analysis of the Chinese biotechnology industry. Along with the collection of primary data we also collected secondary data through academic journals, internet sources and articles in magazines. The secondary data mainly provided data concerning the Chinese science and technology system, the Chinese military along with the Chinese transition economy in general.

The establishment of spin-off companies in China

The following empirical description is divided in two sections. The first section provides a historical backdrop of new high-tech companies in China; this will provide understanding of the historical context in which the birth of new companies and spin-offs came about in China. In the second section the story of a Chinese biotech corporate spin-off company is presented.

The emergence of new high-tech ventures in China – a historical backdrop

Before the opening up of the Chinese economy in 1978 the Chinese business landscape only consisted of large state-owned enterprises (SOEs) that produced and supplied products decided by the Chinese government. The main part of the products was related to the heavy industry and the defense industry. Normally the industrial companies were not involved in R&D activities and the companies only engaged in R&D when it was decided by the Chinese authorities; instead R&D activities were mainly performed by state-owned research institutes and universities. As a consequence there were no direct interaction between science and industry. This situation changed with the introduction of the "open-door policy" in 1978 which was the starting point of the transformation and modernization of China and the Chinese business landscape. With the policy the Chinese government encouraged the development of new businesses with new types of ownerships. As a consequence collectively owned businesses, mainly township and village-based enterprises (TVEs) and household business became a natural part of the Chinese business landscape in the 1980s (He 2009), however these companies were mainly involved in sectors characterized as low-tech or non-innovative. During the late 1980s the Chinese government issued a new wave of reforms related to the transformation of the Chinese business landscape, which explicitly pointed to the establishment of new companies within strategically important sectors based on scientific knowledge. Science and technology related to seven high-tech sectors were pointed out as of future importance of the Chinese economy; biotechnology and agricultural technology, information technology, automation technology, advanced materials, energy technology, environment technology and space technology (Simon 1989). To spur new companies within high-tech industries the Chinese government decided to establish economic zones and science parks all over China (ibid). Along with an increased focus on developing high-tech sectors the Chinese government also explicitly pronounced the importance of private firms to increase the pace of Chinas modernization (He 2009)[1]. For example individual scientists were encouraged to commercialize research at the same time as the government cut budgets for research institutes with the aim to force research organizations to finance their research by selling off research or creating spin-offs companies (Baark 2001). New start-up companies and spin-offs increased in the mid- and late 1990s, many of these were located in science parks offering reimbursements, preferable loans, tax reductions etc. (Suttmeier & Cao 1999). In 2001 around 2.4 million small and medium enterprises (SMEs) existed in China (Chen 2006) while Hu and Mathews (2008) estimated that approximately 43 000 university spin-off companies were created between 1997 and 2004. This backdrop reveals that the emergence of new spin-off companies within high-tech sectors are a relative new phenomenon in China, and in the following sections we take a closer look at one of these spin-off companies; a biotechnology corporate spin-off company originating from a large company group in China.

The formation of a Chinese CSO within the biotechnology field

Parent organization and the diversification of core business

Cardio Group is a large private conglomerate with around 3000 employees mainly focusing on developing and producing products based on traditional Chinese herbs and medicine (traditional Chinese medicine, TCM). The conglomerate was established by a scientist in the mid-1990s as a spin-off from a military research institute focusing on developing TCM drugs. Since then the company have mainly been focusing on using herbal mixtures in a variety of application areas such as drugs, health products and cosmetic products. With the introduction of a TCM drug

[1] In 1997 Chinese entrepreneurs were also invited to join the Chinese Communist Party (CCP).

targeting cardiovascular problems Cardio Group reached blockbuster sales of more than US$ 140 million annually and the revenue reached more than 9 billion RMB (US$ 1.5 billion) in 2009. In the late 1990s the group decided to expand the scope of business to also include drugs based on biotechnology since the large conglomerates saw the future potential of the Chinese biotechnology industry and hoped for a good investment. However drugs based on biotechnology is more challenging compared to TCM drugs; first the company need to handle living organisms which are delicate large molecules that easily can alter its activity and function, secondly the company need to adhere to very strict regulatory demands from public authorities, third the company need to invest in expensive high-tech equipment, forth the lead-times of drugs are in average more than 10 years of development before market launch and fifth a majority of biotechnology companies show red numbers (Pisano, 2006; Robbins-Roth, 2000). In spite of having no earlier experience from biotechnology along with a general challenging biotechnology environment the large conglomerate decided to diversify its business to also include drugs based on biotechnology.

The first step was the establishment of a biotech R&D unit within the Cardio Institute, the central R&D unit of the Cardio Group, which was located at the conglomerates main headquarters at a science park in the north of China. The conglomerate consisted of several central units providing services to more than 10 subsidiaries all over China. These were units including a clinical trials unit handling all clinical trials and relations to the Chinese SFDA (drug authority), a financing unit handling economic and financial investments along with a communication units handling information to media. Still biotechnology was a new area for the Cardio Group and the company did not have the internal knowledge of developing biotechnology drugs. Thus after the physical establishment of the biotech R&D unit the search for suitable personnel with suitable biotechnology knowledge started. The Cardio Group appointed a Chinese professor with international experience from biotechnology science and business as Director of the newly established biotech R&D unit in early 2000. Within a few months the professor employed another 22 people, a majority directly from the university. More importantly the professor also became responsible of finding a first drug development project that could constitute the technology base of the new biotechnology business of the Cardio Group.

The parent organization accessing an PLA drug project

The parent organization gave the new Director of the biotech R&D unit a large degree of freedom in deciding the direction of the new R&D unit including what drug development project to focus on. After reviewing around 30 drug projects the Director decided to buy a drug development project from a research institute, a R&D unit, belonging to the People's Liberation Army (PLA). In understanding the role of R&D units belonging to the PLA we have to take a closer look at the PLA from a historical perspective. As mentioned before 1978 much of the industrial activities in China were related to the defense sector. The PLA owned "third line" factories in remote areas in China with the purpose to produce armor and consumables to the military. At the same time PLA was also involved in scientific development through several research institutes, where the Chinese Military Academy of Sciences was the main research institute. With the success in developing "two bombs and one satellite" in the mid-1960s the research institutes belonging to the PLA proved their scientific ability (Simon, 1989). Thus the PLA research institutes had an established organization both in supplying products decided by the state government but also in developing and producing products based on scientific discoveries. During the Cultural Revolution (1966-1976), when the whole university and scientific infrastructure were destroyed the Chinese military and its research institutes remained somewhat intact. As a result the PLA was the best developed organizations in China in the late 1970s and therefore the PLA was appointed as one of "four modernizations", leading the transformation from a plan economy into a "socialistic market economy". As a consequence the PLA was encouraged to engage in business activities which were spurred by the fact that the state council cut the military budget (Karmel, 1997). The result was that the PLA became owners in a variety of businesses all over China, some being high-tech companies. In the beginning of the 1990s it is estimated that between 10 000-15 000 companies were under PLA ownership employing more than 700 000 people in China (Bitzinger, 2007; Karmel, 1997; Lee, 2006). In line with the transformation and modernization of the PLA the PLA research institutes also became more and more engaged in developing products for civilian use. Thus the PLA research institutes directed their business towards the commercialization of scientific discoveries and applied research. Nevertheless in 1998 the Chinese state council realized that the PLA and its business activities constituted a large part of the Chinese economy and hence issued regulations that forbid PLA ownership in business (Shambaugh, 2004). Consequently companies under PLA control were transformed to other types of ownerships such as SOEs, private businesses or TVEs (ibid). This also meant that PLA research institutes were not allowed to establish and spin-off companies by themselves, instead they had to connect to companies to be able to commercialize its scientific discoveries. This was what happened when the new biotech R&D unit of Cardio Group acquired the drug project from a PLA R&D unit. The unit constituted of scientists with expertise in blood related research and the focal drug project had been developed since the early 1990s and was targeting acute heart attack. Since the Cardio Group was focusing on targeting cardiovascular related diseases the drug project was a suitable drug for the parent organization. An advantage of purchasing a drug project from the PLA R&D unit was due to the specific rules of employment within the PLA, regulations that hindered employees to be employed outside of the PLA. This meant that the biotech R&D unit could easily access knowledge concerning the whole development process of the new drug.

Develop the drug project within the parent organization and spinning off the drug project into a separate CSO

In early 2001 after finishing the first clinical trials a purchasing agreement was signed between the Cardio Group and the PLA R&D unit. Thereafter the drug project was transferred to the biotech R&D unit belonging to the parent organization, Cardio Group. Based on the results from the first clinical trials the biotech R&D team of totally 23 people with the help from the PLA R&D unit refined the technique for the coming second clinical trials. The biotech R&D unit also interacted internally within the parent organization; with the central clinical unit in gaining understanding of the clinical process and regulations, along with the central financial unit since the biotech R&D unit needed financial support in setting up its activity. After a few months of refining the technique and preparing for the production of clinical samples Cardio Group decided to spin-off the whole biotech R&D unit into a separate company, Cardio Biopharmaceutical. As a consequence the new company was legally set up in the Shanghai Zhangjiang High-tech Park, however the parent organization still remained as a large share-holder of the new company. Thereafter the whole biotech R&D team along with some R&D equipment was relocated to Shanghai and the Director of the biotech R&D unit was appointed as general manager of the new company. Just like the biotech R&D unit of Cardio Group the new company, Cardio Pharmaceutical, also enjoyed a large degree of freedom and independence in relation to the parent organization. Cardio Pharmaceutical used the parent organization and its successful business for creating legitimacy to its drug project, which attracted more than 10 million RMB (US$ 1.6 million) in government funding along with preferable tax conditions etc.

When transferring the whole developing team to Shanghai a R&D unit was established. The unit continued with the production of clinical samples for the clinical trials in close cooperation with the PLA R&D unit. The cooperation between the new company and the PLA R&D unit increased and some of the scientists from the PLA R&D unit were employed part-time at the new company, especially focusing on providing training of the employees that lacked experience from both R&D and production. At the same time the company deepened the cooperation with the PLA R&D unit through a new collaboration drug project, where the same basic technique was applied but for other using areas. In parallel to this development Cardio Pharmaceutical was establishing the production process of the drug, a process that was directed by the clinical trials originally developed by the PLA R&D unit but refined in cooperation with the new company in Shanghai.

When the Cardio Group bought the drug project in late development the drug had already finished clinical phase one trials. This meant that the PLA R&D unit already appointed clinical hospitals to perform clinical trials of the new drug; hence relationships between the PLA R&D unit and potential users were already in existence. As a result Cardio Pharmaceutical could not only "tap" into the drug developing pipeline of the PLA R&D unit but also "tap" into the established relationships between the R&D unit and clinical hospitals along with regulatory agencies belonging to the SFDA. The relationships between Cardio Pharmaceutical and clinical hospitals were crucial in the further commercialization of the drug and remaining clinical trials. Through the clinical trials the new company could connect to their first customers, since the first batches of drugs were supplied to hospitals involved in clinical trials. On the other hand in supplying the final drugs to hospitals the parent organization was important since the group had an established distribution network along with sales agents all over China.

Parent organization take direct management control of the CSO

The development and commercialization of the drug at the new company was delayed, partly due to the fact that there were problems in constructing and setting up the production factory and partly due to a corruption scandal exposed in 2005 at the SFDA. As a consequence the third clinical trials were not finished until mid-2005 and the final new drug application (NDA) was not filed to the SFDA until mid-2006, and the remaining GMP-approval of the production process and the factory also was delayed further. As a consequence of delays along with wanting more control of the company the parent organization, Cardio Group, decided to take direct control over the CSO once again by appointing the Vice President of the Cardio Group as new general manager of Cardio Pharmaceutical. As a consequence the Professor that had been in charge since the purchase of the drug project from the PLA R&D unit had to find work elsewhere. With the new manager in place the company focused on finding new investors to support the final drug licensing procedure. In late 2006 a UK venture capital firm invested in Cardio Pharmaceutical, but the Cardio Group still remained as majority owner of the company. In 2011 Cardio Pharmaceutical finally succeeded in launching the first drug targeting acute heart attack.

Discussion

The aim behind the following discussion is to give understanding to how Chinese CSOs are establishing their business. We will analyze the relationship between the CSO and the parent organization along with the relationship between the CSO and the technical source (the PLA R&D unit) and thereby sort out what resources these two relationships contribute with and how these effects the development of the CSO. Moreover through the analysis of the relationships we also aim to discuss the entrepreneurial context in which Chinese biotech CSOs establish its business.

Analyzing key relationships of the CSO and its connection to the Chinese entrepreneurial context

Based on the case description it is evident that the two studied relationships are critical to the CSO. Through the relationships the CSO can access and develop resources necessary for its development and its business activities. In line with other scholars the formation of the spin-off is interdependent to other organizations and it is evident that the two relationships could be regarded as the CSOs most valuable resources (c.f. Xie & White 2004; Håkansson & Waluszewski 2007).

If we first analyze the relationship between the CSO and the parent organization we can see that the parent organization is important in providing financing in order to set up the "seed" to the CSO, i.e. the biotech R&D unit belonging to the parent organization. It is money from the parent organization that establishes the R&D unit as an organizational unit with specific expertise in biotech knowledge. More importantly it was the parent organization that initially purchased the drug project from the PLA R&D unit however due to the advice from the new director. When the R&D unit was established with organizational resources such as personnel and routines along with some technical resources such as equipment and a drug project the R&D unit could be spun off from the parent organization. In setting up the new CSO in Shanghai the relationship with the parent organization provided financial resources to set up the company both organizationally and technically; such as the R&D unit, clinical production and the production process of the drug project originating from the PLA R&D unit. In developing the CSO further the relationship to the parent organization was important since the CSO could access technical resources such as transportation and distribution of the drug. Thus the CSO could use the established resource structure of the parent organization in order to establish its business. Moreover the CSO uses the parent organization to gain legitimacy to its business and thereby generate government funding. The case clearly reveals that the core business of the CSO is far from the parent organizations core business. Since the parent organization lack biotech knowledge the CSO can operate rather autonomous in relation to its parent organization. However as the CSO approaches market launch the pressure to deliver increases which explains why the parent organization decided to appoint a new general manager of the CSO, a manager from the top management team of the parent organization. Without the established relationship to the parent organization the CSO would have great difficulties in establish its business and we can see that the establishment and development of the Chinese CSO is very similar to what Parhankangas & Arenius (2003) refer to as a corporate spin-off within the technology group. The technology developed by the CSO is far from the core business of the parent organization yet the spin-off can take advantage of some of the parent companies established resources. The CSO has the freedom to act independently but when approaching market launch then the parent organization wants to gain control over the CSO. The CSO can also be characterized as a "sponsored" spin-off since the parent organization decides to keep ownership of the new CSO (Wallin & Lindholm Dahlstrand 2006).

In gaining specific technical biotech knowledge the dependence of the CSO on the technical source is evident in the case description. As a result the relationship with the technical source especially provides development of technical resources. It was the technical source that provided the technical base of the focal drug product targeting acute heart attack. The PLA R&D unit provides the core technique and scientific knowledge to constitute the actual establishment of the CSO. The technical source itself is an organizational unit with scientific expertise in blood research developed during a long period of time also the unit belongs to the PLA with an established resource structure. The relationship with the PLA R&D unit did not only provide the CSO with a product but also with organizational relationships to clinical units, as a consequence the CSO gained access to users. Here it is evident that exiting relationships provides access to other critical relationships (c.f. Gadde et al. 2012). Moreover the relationship with PLA R&D unit also provides training of personnel that affect organizational resources of the CSO, a necessary resource in order to proceed with both clinical production but also large scale production. Along with this the PLA R&D unit provided knowledge necessary for setting up R&D activities, clinical production and production of the new drug. By using the knowledge from the PLA R&D unit suitable technical resources such as equipment could be linked and adapted. As the relationship between the CSO and the PLA R&D unit evolved the parties decided to engage in a new development project targeting another blood-related product. Without the relationship to the technical source the CSO would have great difficulties in engaging R&D and production along with connecting to users.

The case of the Chinese CSO and its formation (and its interrelated relationships to the parent organization and technical source) is indirectly affected by the Chinese entrepreneurial context. The creation of spin-offs and new high-tech firms are driven by the Chinese government through a variety of measures such as industrial and S&T policies along with tax-reductions and other government reimbursements. The choice by the parent organization in diversifying its core business to also include drugs based on biotechnology, with its high failure rate, can indirectly been spurred by the Chinese government since the government promote financially strong companies to get involved in the emerging biotech industry. The government hopes that new companies will provide large-scale production structures for future biotech drugs. At the same time the Chinese government has encouraged research institute and universities to become more entrepreneurial by cutting research budgets. However the case in this paper display a specific situation involving a research institute belonging to the PLA, an organization that is forbidden to create and own spin-off companies. PLA is forced to engage in relationships with companies in being able to commercialize its research; however this also means that they are unable to keep direct control of the commercialization process of its scientific results.

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