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A Case Study on Intellectual Property Rights for the Technology Commercialization of Technology Startup Companies in Korea

Suh Myung Chul [1], Chang Ho Yu[2] and Seung-Hwan Jang[3*]

[1] Master's degree, Graduate School of Technology Entrepreneurship, Pusan National University, Korea
[2, 3] Research Professor, Graduate School of Technology Entrepreneurship, Pusan National University, Korea
** Corresponding Author : jangsh0225@pusan.ac.kr*

Abstract: Intellectual property rights are very important for technology startup companies that try to enter the market through the development and commercialization of new technologies. Given the situation in Korea, however, intellectual property management is being carried out mainly by some large corporations and numerous technology startup companies do not know what intellectual property management is. Even though they recognize the need for this, there are only a few companies that implement and operate the system systematically. In order to find out the solution of this situation, this study suggests ways to utilize its own technology commercialization of technology start-up companies based on the research of existing research literature and cases of technology start-up companies etc.

Keywords: Technology Startup Companies, Technology Commercialization, Intellectual Property Rights

1. INTRODUCTION

Recently, the global economy has continued to suffer from the global financial crisis and low growth without employment and has structural problems such as deterioration of the real economy due to the slowdown of national economic growth. One of the ways to solve this economic crisis is to activate start-up based on creative ideas and innovative technologies.

Thus, the paradigm of the current world economy is being converted into a knowledge-based economy determined by knowledge activities such as research and development, emotion, and creativity, not physical production activities and the source of added value and competitiveness creation is being changed from traditional assets such as land, labor, capital to intangible assets such as intellectual property.

By fostering successful venture businesses using intellectual property that utilize innovative new technologies in early days, developed technology startup countries such as the US, Finland and Israel are

striving to maintain national competitiveness through the activation of the technology-related market, which is revealed as the revitalization of ecosystems throughout technology startups.

Studies on the factors affecting the success and growth of technology startup companies have been actively carried out in Korea as well as in developed countries. Looking at the previous studies on existing technology start-up companies, the main purpose of the studies was to identify the characteristics of entrepreneurs and management strategies as the same single-dimensional function relationship for business performance by composing the characteristics of entrepreneurs and management strategies as main independent factors.

Thus, Covin and Slevin (1991) pointed out that this single-dimensional study had limitations in explaining technology startups, and Lumpkin and Dess (1996) said that multidimensional studies combining various dimensions for management strategy are needed.

In addition, McMullan and Melnyk (1998) argued that the research on the technology commercialization process was mainly conceptual and showed similar patterns for each researcher and institution, while the factors influencing the technology commercialization were the most important factors in the success and failure of technology commercialization. However, there are only a few studies on the factors affecting this.

The purpose of this study is to present an efficient patent measure so that technology startup companies will be activated in the future by carrying out research with the case of a patent strategy which is one of the management strategy methods from the perspective of factors affecting technology commercialization of technology start-up companies.

2. THEORETICAL BACKGROUND

2.1. Startup company

The definition of startup is not uniform and is defined differently according to the laws and regulations supporting it and is applied differently depending on the contents to be supported.

Drucker (1985) defined it as the ability to create new wealth and innovative actions to input existing resources, and Timmons (1989) stated that startup is a humanistic and creative action that achieves something valuable from virtually nothing and is to seek opportunities without taking into account the current resources or the lack. It can be also said that startup is the creation of a company whose purpose is to make money by individuals or corporations or founders start business activities that have business ideas and combine resources to market.

For the definition of a technology startup company, Bollinger *et al.* (1986) said that it is a company established by a small number of people with innovative technology and business motivation and Cooper *et al.* (1986) said that it is a company focusing on research and development or on the use of new technologies or knowledge.

Kortum and Lerner (2000) stated that technology-based startups not only serve as the driving force of innovation in various industries, but also play a role in national economic development.

According to Korean law, technology startup refers to startup in the fields of manufacturing, professional services (professionalism, science, technology), and knowledge culture business. According to

the 'Act on Special Measures for the Promotion of Venture Business', small and medium enterprises with excellent technology and management innovation capabilities based on technology are classified as venture companies.

As shown above, the meaning of technology start-up is various, but it can be defined as the start of a new business in order to pursue high-risk, high-profit business with innovative technology.

2.2. Technology commercialization

Cooper (1986) defined the process of technology commercialization as a process that meets the needs of consumers in terms of customers. Limiting technology commercialization to the basic research which is a research and development activity and cases in which products or services are created after the development stage, Nevens *et al.* (1990) said that it can be defined as a continuous process from prototype manufacturing, trial production, mass production, marketing and sales activities in order to connect new technology acquired through own Research & Development or external procurement to actual production and sales.

In Korea, technology commercialization recognized as a key element in securing competitiveness and overall management of companies is based on the Act on Transfer of Technology and Promotion of Commercialization and is defined as applying technology to develop, produce, sell and distribute products or improve technology during the course in accordance with Article 2 of the Act on Transfer of Technology and Promotion of Commercialization.

The ability to commercialize technology is a factor that improves technology and applies it directly to production activities and sales activities and is defined as the ability to perform production and marketing activities using technology and related various activities. The technology commercialization ability is a factor that improves the technology and directly uses it in the production and sales activities of the company and described the ability to perform various activities such as production and marketing activities using technology and the study by Nevens *et al.* (1990) explained the ability to commercialize technology as competitive advantage through new technology acquisition, quality improvement, and cost reduction and argued that in order to improve the technology commercialization capability, it is important to achieve the company's goal through the CEO's will, in other words, setting goals for technology commercialization.

Zahra and Nielsen (2002) analyzed 119 companies to find out the effect of using internal and external resources for successful technology commercialization of the company and as a result, it was found that internal workforce and technology-based manufacturing resources have a positive relationship with technology commercialization and the formal / informal integration mechanism plays a crucial coordinating role between resource capacity and technology commercialization.

2.3. Intellectual property rights

The concept of intellectual property is different in the area and scope according to the specificity of scholars and research institutes. In addition, the scope of the intellectual property rights are being expanded with the development of the times and technologies rather than the idea being finalized.

The World Intellectual Property Organization specifies the definition of intellectual property into six categories and Framework Act on intellectual property defines it as results produced by human creative

activities in all fields such as science, industry, culture, and arts and something that can realize property values. Also, Singh (2004) said that the intellectual property rights are the result of multiple interactions appropriate to the condition by organization, culture system, system and the development of intellectual property rights means that the government provides opportunities for individuals and stakeholders while providing adequate systems. Korea's intellectual property rights have been used in various names such as intellectual property rights, intellectual ownership rights, mental ownership rights, industrial property rights, industrial ownership rights etc. and according to Article 3 of the Framework Act on intellectual property, intellectual property is a thing that can realize property value as knowledge, information, technology, expression of ideas or emotions created or discovered by human creative activities or experiences, display of business or goods, varieties or genetic resources of creatures, and other intangibles.

In other words, intellectual property rights generally mean legal rights to protect intangible goods with economic value as mental creation obtained based on human mental creative activities.

Wernerfelt (1984) observed technological capabilities from a resource-based perspective and referred to them as a source of competitive advantage of companies, and Hall (1994) emphasized that the permanent competitiveness of a company is its technical ability to use intangible resources such as licenses and patents, and the resulting importance.

The study of Gould and Gruben (1996) showed the result that the relationship between patent rights and economic effects is a significant positive direction. The study of Austin (1993) conducted the patent valuation using a capital asset pricing model in order to carry out corporate value and patent impact evaluation for 20 companies.

3. INTELLECTUAL PROPERTY CASE STUDY FOR TECHNOLOGY COMMERCIALIZATION

3.1. Technology commercialization based on intellectual property rights

The ultimate goal of technology commercialization is to maximize the value of technology innovation (Kim and Mauborgne, 2005). Specifically, patents play a role in protecting the R & D performance of companies and thus provide economic performance to companies(Gallini, 2002).

In establishing a technology commercialization strategy, information that can be obtained through patent analysis is mainly bibliographic information, citation information between patents, number of patent registrations, etc. and can be processed into information useful for strategic decision making through the information (Ha *et al.*, 2015). As the only data directly linked to the achievements of research and development, patents have the advantage of being able to clearly demonstrate the technological innovation activities of companies (Ernst *et al.*, 2004).

A patent portfolio is a concept that is a set of contents related to the information of technology of a patent and a detailed topic (Tseng *et al.*, 2011). Utilizing a patent portfolio among useful ways to closely identify information within a patent is seen as the most appropriate way to structure and visualize the contents critical to most technically relevant information and decision making a corporate industrial environment (Lee *et al.*, 2009).

Ernst (2003)'s study used two dimensions such as patent activity and patent quality to present a

strategy map related to technology commercialization at the enterprise level. Patent indices used to conduct the patent analysis vary according to researcher's research purpose. Patent indices for technology commercialization can be classified into motives, technological strategy, and valuation depending on purpose (Tseng *et al.*, 2011).

3.2. Application example of technology start-up company (Bukyoung Water Corp. in Korea)

3.2.1. Main Status

Bukyoung Water Corp. was established in April 2008 as a technology startup company located in Busan, Korea. It was selected as a special company for military service exemption in September 2015 and its attached research institute was established. Starting from ready-made products, Bukyoung Water Corp. is characterized by its technology commercialization in progress by inventing commercialization of progressively improved innovative products across products and processes rather than an inventive patent and applying for and registering a patent.

One year after establishment of the research center, 13 government projects of total 500 million and 8 government projects of total 350 million were selected in 2016 and 2017, respectively. Two out of the current projects were selected for product commercialization support projects in the second year of research and are in the process of developing new products. Also, the research project of 2016 became the beginning to enter the research and development due to the invention patent of the "water gauge which improves accuracy of flow measurement and performs freeze protection" of the water meter in the beginning of 2014, 5 years after startup.

In the case of technology start-up companies with technological capabilities, it is important to attract investors in order to secure early-stage operating capital if capital is lacking. Investment decisions made by investors for early technology startup companies are inevitably dominated by the value of their technology. Since ordinary patents can not induce investors to make investment decisions, the first priority is to secure original technology. Securing original technology, Bukyoung Water Corp. could attract investors steadily and was able to expand to appropriate strategy because initial fund was stable.

As shown in Figure 1, however, if we look at the sales change from 2008 to 2016, it can be seen that the sales is shifting downward from the peak of 2013, and this shows that intellectual property management performance, which requires the additional invention patent applications and R & D of registration, and the introduction of product commercialization of intellectual property rights, is needed.

3.2.2. Intellectual Property Management Performance Plan

From the planning stage of the research, it is necessary to establish a process for the efficiency of research and development in terms of intellectual property rights and the technical commercialization. For this purpose, the entire cycle of research and development should be divided into three stages of creation, protection and utilization: At the early stages of the research, research and consulting for the creation of intellectual property rights should be conducted. At the stage of the performance by the research, the strategy for the protection of intellectual property rights should be established and an intellectual property strategy throughout the entire research and development cycle through the commercialization of retained

Table 1
Patent application and registration status of Bukyoung Water Corp.

Coverage	*Number*	*Patent*	*Name of invention*	*Technology*	*Final goal*	*Date of application*	*Registration No./ Registration date*
Water meter	1	Variable member strainer	Water gauge that improves accuracy of flow measurement and performs freeze protection	Water meter purification improvement and freeze protection	Development of variable member	2014.01.15	No. 10-1381700 / 2014.03.31
	2	Flow path concentrated strainer	Water gauge capable of precise flow meter reading without leakage	Improved water meter accuracy	Development of flow path concentrated strainer	2016.08.10	No. 10-1782375/ 2017.09.21
	3	Electronic meter	Electronic water gauge	Improved electronic meter accuracy	Development of electronic meter	2016.11.14	Registration notice / 2017.07.20
Water meter box	4	Convenient water meter box reading	Structure of water gauge water meter box that can open the upper lid lock function and the lid for reading at the same time	Convenient reading by simultaneous opening of lids	Development of water meter box lid for convenient reading	2016.11.09	No. 10-1737804 / 2017.05.05
	5	Water meter box air cap +camera	Water meter water meter box with improved accuracy and easy outdoor reading	Freeze protection, outdoor meter reading	Development of water meter box lid that enables freeze protection and outdoor meter reading	2016.11.28	Registration notice / 2017.06.28
Train test stand	6	Train stand	How to check the performance of water meter	Development of automatic water meter performance inspection unit	Development of automatic water meter performance inspection unit	2017.01.23	No. 10-1776582 / 2017.09.04

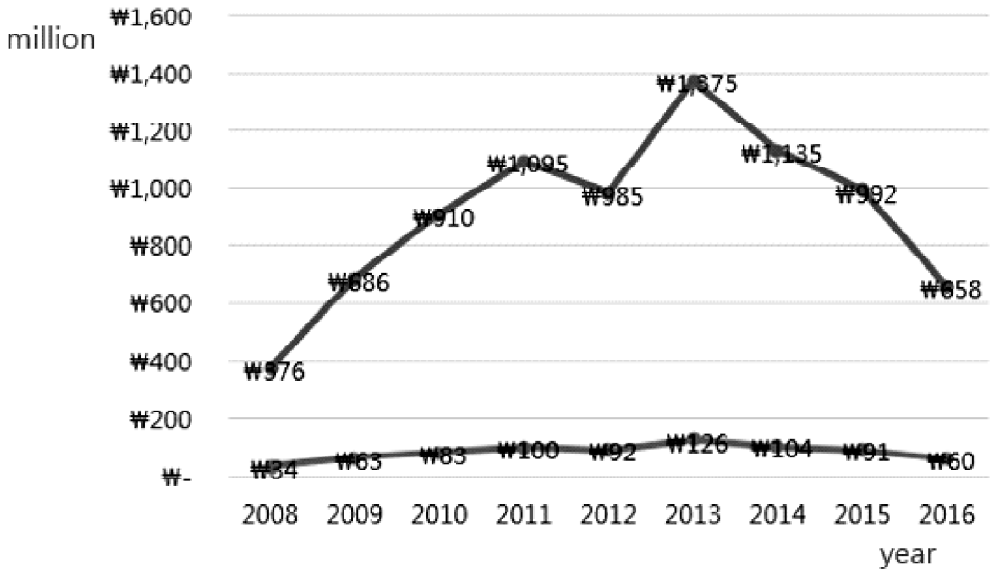

Figure 1: Change in sales and ordinary net income by year Bukyoung Water Corp. (V.A.T. not included)

intellectual property rights and the linkage to follow-up research should be established and technology completeness and business value should be enhanced.

In other words, if a technology startup has the ability to secure R & D capability and excellent technology, this process can lead to technical commercialization in the future. Therefore, if the company obtains excellent intellectual property rights, it will lead to technology commercialization and therefore, it is necessary to enhance competitiveness in this sector and especially, a long-term approach is also needed. It is judged that the competence required for intellectual property rights will be necessary because the continuous efforts and investment to obtain intellectual property rights based on the technological innovation of the enterprise are the shortcut to technology commercialization.

The invention of innovative technology can be seen as a key asset to enhance competitiveness because it can change an existing method or process into a new paradigm (Arthur, 2009). What's even more fatal is that innovative inventions can destroy existing competition system and can be the opportunity to pioneer new markets or break down existing No. 1 company (Christensen, 2013).

4. CONCLUSION

Innovative competencies of companies depend on how much intellectual property and technology can be secured and the upper hand can be gained (Pohlmann *et al.*, 2016). And the holding of intellectual property of the enterprise serves not only as a means of proving the technological power, but also as a legitimate means of obtaining exclusive monopoly in the market.

Thus, research on intellectual property rights has been carried out for decades, but there are not many studies on the relationship between intellectual property rights and technology commercialization. In particular, there is little research on the role of intellectual property rights as a factor influencing technology commercialization of technology startups.

Therefore, this study was to investigate patent cases of technology startups after comprehensive and detailed review of literature and suggest contents that can take measures necessary for efficient intellectual property management for entrepreneurs who wish technology startup later.

Since the intellectual property right is a source of competitiveness from a practical point of view of the company, it is necessary to protect the core technology of the product as the patent by patenting the core technology that generates profit as the core asset of the technology start-up company and competitive advantage should be secured by linking patented technology to products.

And technology startups need to focus more on recognizing the importance of intellectual property rights and securing and managing intellectual property rights by making the most of the programs and support systems that can be utilized because the Korean Intellectual Property Office (KIPO) and government agencies have various programs and various support systems for enhancing the competitiveness of small and medium enterprises.

The limitations of the study are as follows: The theoretical basis is somewhat insufficient because only one of the technology startup companies was surveyed and no hypotheses were drawn through the survey. Therefore, in order to overcome the limitations of this study, it is necessary to continue to study the efficient management plan for nurturing the early technology start-ups. In addition, if these studies are appropriately considered and analyzed, it is expected that strategies for effective intellectual property rights and additional operation plans for technology startup companies will appear from a broad perspective in the future.

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