Contents lists available at Science-Gate

International Journal of Advanced and Applied Sciences

Journal homepage: http://www.science-gate.com/IJAAS.html

Technology valuation for intellectual property commercialization

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ARTICLE INFO

Article history:
Received 27 December 2021
Received in revised form
15 May 2022
Accepted 23 May 2022

Keywords:
Income approach
Transfer and commercialization
License transfer
Intellectual property rights
Valuation

ABSTRACT

This study was conducted to evaluate the technical value of 19 intellectual property rights held by the Korea Research Institute of Bioscience and Biotechnology, and the purpose of this valuation is to promote commercialization by acquiring the technology transfer or exclusive license for the intellectual property rights. This study examines the theoretical and practical aspects of the valuation methods and procedures of the income approach that are useful for valuing intellectual property. Assuming that bioscience and biotechnology firms receive license transfer of intellectual property held by a foreign company, the valuation analysis of intellectual property based on the profit approach is based on business plans and financial statements of domestic companies. After calculating the operating profit from the gross profit of the company in detail, the corporation tax and the capital cost are taken into account and the depreciation cost is increased or decreased to calculate the excess profit and multiply the present value by the present value. We propose an income approach model and a case analysis to obtain the ultimate value of intellectual property by multiplying the contribution by this factor. It is not easy to predict future cash flows and estimate various financial statements, and there is a limit to the possibility that the evaluator will be subject to the estimation of the appropriate discount rate. More detailed and partial complementary research classified by the industry size is to be left as a future study.

1. Introduction

Intellectual property rights, which play a key role in creating jobs and increasing income, are essential in the fourth industrial revolution economy. In this paradigm, many economic actors are focusing on intellectual property management, and efforts to ultimately achieve sustainable growth of companies are increasing by establishing strong intellectual property rights. In accordance with such changes in the economic environment, the proportion of brands, patent rights, trademark rights, etc. is greatly increasing, as well as the need to reasonably and objectively evaluate the value of intellectual property rights (Yoon and Kim, 2019). In addition, rational and objective evaluation of the value of intellectual property rights for the purposes of collective security system, unified technology, and credit evaluation, asset structure change, mergers and acquisitions(M&A), transaction price calculation for transfer transactions and commercialization, strategy, financial support, investment decision making, and litigation. This study was conducted to evaluate the technology value of the 19 patents held by the Korea Research Institute of Bioscience and Biotechnology. The purpose of this evaluation is limited to the transfer and technology transaction of the patented technology, and the commercialization of the patent is made by acquiring technology transfer or exclusive license to Z, an independent subsidiary of the Korea Research Institute of Bioscience and Biotechnology. As it is planned to promote the business, the feasibility evaluation was evaluated based on the business status and commercialization status of Z Co., Ltd., the business entity. The applicant company, Korea Research Institute of Bioscience and Biotechnology, is a non-profit corporation established in April 1984. It has a total of 60 employees, most of which are devoted to R&D. It shows an oriented manpower structure. Meanwhile, the company has registered or applied for 117 domestic and foreign patents in addition to the method of attacking viral genes through various research and development, and is establishing itself as a domestically recognized research institute in the

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field of vaccine development. It is currently designated as a WHO research cooperation organization. In addition to the animal, plant, and microbial cell culture facilities, the company has a variety of genetic recombination-related facilities, as well as a variety of expensive research facilities necessary for the research and development of pharmaceuticals and functional food materials.

Z Co., Ltd., the company to which the technology will be transferred, is a spin-off company launched with a capital of 500 million won. Executive Director Kim, who served as the managing director at AAA Co., Ltd., served as the CEO, and vaccine a total of 17 people from the Korea Research Institute of Bioscience and Biotechnology participated. More than 90% of these are made up of researchers, and although they do not have their own facilities, all facilities within the Korea Research Institute of Bioscience and Biotechnology are being used and R&D is continuously being conducted. In addition, there is a technical advisory committee composed of eight academic personnel including Jang, the president of Korea University Medical School.

The application technology is a field of medical development that requires a high technical level, such as hepatitis B treatment vaccine, tsutsugamushi vaccine, and DNA vaccine-related technology. The company's technology encompasses the manufacturing technology of excellent antigens and diagnostic reagents acquired accordingly through mass culture technology of pathogens, antigen purification technology, and pathogen inactivation technology. It is the result of research over the years.

This study is the product of a total of 4 patents (hepatitis B treatment vaccine, tsutsugamushi vaccine, hantan virus vaccine, and C-type DNA vaccine) that the Korea Research Institute of Biomedical Engineering intends to transfer to Z Co., Ltd. It was classified, assessed the related technology value, and calculated the value of technology assets based on this. The 19 patent-related technology values of the Korea Research Institute of Bioscience and Biotechnology are calculated by estimating future profits because there is no comparable market transaction value. The four technologies subject to this evaluation are held in the form of 19 patents based on the technical know-how and technical database accumulated by the Korea Research Institute of Bioscience and Biotechnology for many years. In the evaluation, technology assets are evaluated only as registered with intellectual property rights. Therefore, the Korea Research Institute of Bioscience and Biotechnology analyzed the technology performance and feasibility of the core technologies included in the commercialization of the four technologies that were intended to be commercialized by transferring the technology and calculated the technology value based on this.

2. Related works

As the 4th industrial revolution and technological competition between companies and countries accelerate, various studies on the valuation of intangible assets such as technology have been conducted. Results are emerging. Accordingly, the research on the evaluation of domestic and foreign technology values is as follows.

Research on technology value evaluation can be broadly divided into research on models or techniques that perform valuation and research on factors affecting technology value.

First, as a study on the technique of performing technology value evaluation, Bardhan et al. (2004) developed a real options method that considers project continuity and interdependence in order to prioritize and measure the value of an IT portfolio. In previous studies, the real option method conducted a valuation of a single project and generally ignored the effects of interdependence between projects. At the same time, a model that can be evaluated was presented (Bardhan et al., 2004).

Baek et al. (2007) conducted technology value evaluation by dividing it into three stages based on both the profit approach and the real option method: Expected return analysis, technology contribution analysis, and technology value evaluation from the buyer's point of view. In the first stage, expected revenue analysis, product market, and cost structure analysis were used by technology type to measure the amount of revenue generated during a specific period. It was converted to present value. In the second stage, technology contribution analysis, the degree of contribution of technology to expected returns considering the level of technological innovation and the characteristics of the industry to which the technology belongs was measured. The value was evaluated by applying the Black-Scholes option pricing model.

Among domestic studies, Park et al. (2009) proposed a hybrid model using the real option method to overcome the limitations of the discounted cash flow method (DCF) and analyzed its applicability. Pointing out that the real option method enables a realistic valuation of risky technology projects than the discounted cash flow method (DCF) model, but it is difficult to apply the real option method, which includes a high degree of a mathematical concept, in realistic situations. The proposed hybrid model can solve this problem. The hybrid model presented a practical model that was simplified enough to be intuitively understood as a model consisting of a binomial grid in the later stage, where market risk composed of a decision tree is a major consideration in the early stage of a project where specific risks exist.

As a study that attempted quantitative analysis of technology value in addition to studies using such a traditional approach, Lee and Khoe (2015) presented a technology value prediction model by regression analysis. Traditional technology valuation methods do not deviate significantly from the discounted cash flow method (DCF) method based on cost-bias analysis and emphasized the need for a more objective and widely used methodology and the impact on technology value. A regression model

was constructed using three factors as explanatory variables among the factors affecting explained.

As a study on factors that affect technology value, Park and Park (2004) classified technology value into intrinsic factors and applied factors. In detail, a method for evaluating technology value was presented by dividing the inherent factors into monopoly status, technology level, technology lifespan, and standardization degree, and subdividing application factors into technology type, contribution rate, application range, and completeness.

Chiesa et al. (2007) defined factors that affect the value of technology assets during technology transactions and analyzed the relationship between each factor and the value of technology assets. As influencing factors, asset-related factors (technological originality, technology relevance, portfolio), company-related factors (development capability, intellectual property, etc.), situation-related factors (industry characteristics, social and economic background), risk-related factors (industry) Risk, technology risk) and transaction-related factors transaction type, contract clause) did.

As a domestic study on the development of indicators for technology value evaluation, Lee (2010) classified factors that affect technology value into four factors: Technological, business, market, and environmental. For technological prowess, there are 22 sub-variables such as technological excellence, while for business feasibility, there are 17 sub-variables including technology commercialization cost. Variables and marketability consisted of 11 sub-variables such as technology commercialization time, and environmental characteristics consisted of a total of 10 sub-variables, including institutional regulatory issues. In the studies of Chiesa et al. (2007), the detailed evaluation indicators that are actually measured in setting the evaluation indicators of technology are different, but in deriving the evaluation indicators, they can be broadly classified into those related to the technology itself and those other than the technology. However, the study of Park and Park (2004) composed the evaluation index with factors that focused on the characteristics of the technology itself.

Oh (2015) pointed out that in the past studies on the value evaluation for commercialization of new technologies, they did not evaluate the technicality and business feasibility of the technology in a balanced way, and evaluated the new technology. A technology evaluation index that can simultaneously consider the technicality and business feasibility of risk technology was proposed. Each of the technical and business feasibility indicators was divided into characteristics, environment, and competitiveness, and four sub-evaluation indicators were proposed for each domain, such as technology type, technological sociality, technological innovation, market structure, competition level, and industry characteristics.

The limitations of the papers of Oh (2015), and Lee and Khoe (2015) are as follows. First, it lacks a description of the valuation approach to the income approach. Most of the papers do not explain the revenue approach methodology in detail, so it is difficult to use them practically. The model analysis of the profit approach is explained, but the actual case analysis based on the model is insufficient. Therefore, in order to secure the reliability and objectivity of valuation, it is necessary to propose a concrete methodology of profit approach to case intellectual property rights. The purpose of this study is to examine the theoretical and practical aspects of valuation methods and procedures for the valuation of intellectual property rights, which are useful for the valuation of the transaction price for technology licensing and for enhancing enterprise value. We will examine in detail the principles, methods, and practical cases of valuation of intellectual property rights for successful commercialization.

3. Materials and methods

Z Biotechnology Research Institute is a non-profit research corporation established for the first time in Korea in May 1991. It has a track record of developing hepatitis diagnostic reagents, AIDS diagnostic reagents, etc., and is the No. 1 research foundation approved by the Ministry of Science and Technology. It is a research institute that has gained worldwide recognition, including being designated as a research institute.

S Co., Ltd. is a spin-off company established within the research center to promote the commercialization of hepatitis vaccine treatment and various related products that the Z Biotechnology Research Institute has accumulated based on 27 years of research experience. Most of the research personnel who worked in the vaccine team of the Engineering Research Institute have been transferred to the company and are focusing on R&D. In addition, the company is pursuing a business by transferring 19 patents owned by the Z Biotechnology Research Institute. The company is planning to secure royalty sales through product sales, and a substantial amount of sales is expected from the second half of 2021.

The company intends to reduce the risks associated with the development of new drugs. Hepatitis B treatment vaccine and Tsutsugamushi preventive vaccine plan to achieve a certain amount of sales within a short period of time through technology transfer (license-out), and plan product sales by completing clinical trials in the future.

Securing profits by technology transfer is a business method that has recently been highlighted in this field. If technology transfer is successful, it is a high value-added business form that can secure royalties according to technology transfer fees and product sales. It is a field that requires sufficient funds for long-term development as it is not possible to expect a clear profit until previous success. As the

company plans to mainly cover R&D expenses from outsourced R&D funds for technology transfer, securing cash flow is the key to business success.

As described above, the hepatitis B treatment vaccine has completed the preclinical phase and is preparing for clinical trials, and plans to transfer technology to clinical phase 2 after two to three years. As a result of the preclinical stage, it is showing relatively good commercialization progress.

The Tsutsugamushi vaccine is a live vaccine that can be said to be the first-generation vaccine, and the development success and commercialization potential are generally higher than that of the hepatitis B treatment vaccine, which is a specific antigen-extracting vaccine. After the technology transfer in 2003 and the completion of domestic clinical trials in 2005, it has a domestic sales plan.

The hepatitis C vaccine is being developed in the form of a DNA prophylactic vaccine and a therapeutic agent such as the hepatitis B vaccine. Initially, after the completion of the development of the hepatitis B vaccine, the company plans to commercialize the treatment product within a short period of time. As of now, there is no specific progress. On the other hand, the DNA hepatitis vaccine is currently being tested on animals.

Since the company expects to secure profits around 2023-2024, it is expected that no full-fledged profits will be generated for the next two to three years. Although external income is expected, cash flow is somewhat liquid.

Technology valuation is the conversion of excess profits generated in the future from specific business units or products in which the technology to be evaluated is implemented, into present values. Excess profit converted to present value generally corresponds to the concept of goodwill or intangible assets, and technology valuation evaluates what the source of intangible assets is and how much is derived from technology assets.

Therefore, technology valuation is to evaluate the proportion of technology assets out of the total intangible asset value. After evaluating the relative contribution of the technology, market, and human factors to be evaluated, the technology contribution is calculated and reflected in the intangible asset value. The evaluation method applied in this evaluation is as follows.

$$Technology\ value = ((Excess\ profit^{t} \times present\ price\ coefficient^{t}) + residual\ value \times present\ price\ coefficient^{n}) \times technology\ contribution$$

where, n is the revenue estimation period.

The technology valuation amount is calculated on the assumption that product development based on patented technology is successfully completed and sales will be generated to patent technology holding companies for the future product life span. This is based on the premise that the patented technology-owned company continues to develop products, produce prototypes, mass-produce and sell products in accordance with the business plan, and does not reflect differences that occur as the business entity changes.

The basic valuation applied in this evaluation is a process of converting excess profits generated in the future into present values. To do this, excess profits must be estimated first. Excess profit is obtained by deducting the cost of sales, sales expenses, general administrative expenses, corporate tax, etc. from sales of specific technologies and products, and then subtracting capital expenses for invested capital. In principle, operating income and operating expenses should be estimated for all future perpetual periods, but since this is practically impossible, we estimate profits over a predictable period of time, and performance after the estimated period is added as residual value. The residual value is an aggregate of the performance of all future periods expected after the estimation period. Since there are no more favorable investment opportunities in the remaining period, there is no new investment and there is no profit growth. Here, the residual value was calculated in the following way (Bodie et al., 2012).

$$Residual\ value = (excess\ profit\ in\ the\ last\ year * present\ price\ coefficient) / discount\ rate.$$

It is necessary to estimate the discount rate to convert future excess profit to present value and to obtain the cost of capital, which is the consideration of invested capital. The discount rate is calculated by a weighted average of the cost of each capital source by weighting each capital composition.

3.1. Sales estimate

In terms of domestic sales, hepatitis B immunotherapy is scheduled to be marketed in Korea in the second half of 2023, occupying 10% of the domestic market (approximately 288 billion won) at the beginning of the market entry, and is assumed to grow by 3% in short term. It was calculated by assuming that it occupies 50% of the domestic market (approximately 34 billion won) at the beginning of the market entry (Table 1).

Table 1: Domestic sales (unit: One million won)

Division	2021	2022	2023	2024	2025	Total
①	-	-	14,400	29,664	30,554	74,618
②	-	-	-	-	17,000	17,000
Total	-	-	14,400	29,664	47,554	91,618

In the case of external sales, the company plans to license out in the overseas market after going through Phase 2 of the company. Overseas sales are divided into technology transfer fees incurred upon license out and Running Royalty incurred when commercialization thereafter. Since it is expected to occur afterward and is included in the calculation of the residual value, detailed calculations are omitted.

The technology transfer fee is usually the current value of the operating profit that the patented technology subject to license out can acquire in the overseas market in the future [expected sales × (1-(average industry cost rate + industry average

SGandA ratio))] at the time of license out. It was calculated by applying the ratio (25%) that is applied to the business. The hepatitis B immunotherapy will be licensed in 2024, and technology transfer fees are assumed to be received by 40%, 30%, and 30% of the general method over three years, and the product commercialization period considered in the calculation is from 2026 to 2030, assuming there is no sales growth (Table 2).

Table 2: Overseas sales (unit: One million won)

Division	2021	2022	2023	2024	2025	Total
①	-	-	-	44,467	33,350	77,817
②	-	-	20,352	15,264	15,264	50,880
Total	-	-	20,352	59,731	48,614	128,697

The preventive vaccine will be licensed in 2022, and the technology transfer fee is assumed to be received by 40%, 30%, and 30% of the general method over three years, and the product commercialization period considered in the calculation is from 2026 to 2035, assuming no sales growth.

3.2. Cost of sales and sales and administrative expenses

As of the evaluation base date, it was impossible to calculate the product cost rate of the company itself because the patented technology to be evaluated is in the trial and development stage, and the same industry, which is the most objective among the first available data (D2423, pharmaceuticals, medical compounds, and herbal products) and average cost rate data ('2019, 2020 business management analysis; published by the Bank of Korea) was referenced (Table 3).

Table 3: Overseas sales (unit: One million won)

2019	2020	Average
58.86%	58.63%	58.75%

Since the cost rate will be different for each product, it is reasonable to classify it, but since it is practically impossible, so, a single cost rate (58.75%) was applied to the total sales.

Selling and administrative expenses are expenses incurred from sales activities such as products and maintenance of the company and are incurred from the moment the company starts business regardless of the timing of sales. The calculation details are shown in Table 4.

Table 4: Ratio of sales and administrative expenses

2019	2020	Average
30.84%	30.78%	30.81%

Full-fledged sales are expected to occur in the second half of 2024, but even before that, fixed costs will be incurred from corporate management and sales activities. Based on this judgment, expenses incurred during the sales preparation period in 2021 and 2023 will be recognized by the company, and the expenses from 2024, when sales began to occur, will be calculated by applying the industry average selling cost and management ratio.

3.3. Depreciation

Since depreciation expenses are included in operating expenses (sales cost, selling expenses, and administrative expenses), profits are estimated using the cost ratio including them (Reilly and Schweihs, 1998). The company plans to invest about 200 million won annually from 2022 in connection with the purchase of research equipment for patent technology development activities (when depreciated assets occur, an annual investment of 400 million won including reinvestment). It was calculated by applying the amortization rate (0.333; depreciation by fixed amount method) for the useful life (three years) of the test and research asset specified in the corporate tax law (Table 5).

3.4. Corporate tax

The corporate tax is expected to be reported and paid from 2024 when sales are expected. This evaluation applies 30.8% (corporate tax 28%, income discounted resident tax 2.8%) to operating profit without reflecting adjustments that occur during tax adjustment.

3.5. Capital cost excess profit

The cost of capital is the consideration of using capital and is generally calculated through the 'invested capital x discount rate' because investors are required to realize a return equivalent to a discount rate from invested capital. Excess profit is the surplus value that improves the enterprise value as the profit remains beyond the cost of capital (Xitiz et al., 2017). This is calculated by subtracting the cost of capital from operating profit after deductions such as corporate tax. Intangible assets are converted from excess future profit into present value, and the value of patented technology is multiplied by technology contribution (Table 6).

Table 5: Depreciation expense (unit: One million won, %)

Division	2021	2022	2023	2024	2025	Total
Annual investment amount	200	200	200	400	400	1,400
Assets subject to amortization	200	400	600	800	1.000	
Amortization ratio	0.333	0.333	0.333	0.333	0.333	
Depreciation expense	67	133	200	266	333	

Table 6: Invested capital (unit: One million won)

Division	2021	2022	2023	2024	2025
Working capital fixed	-	-	19,391	49,882	53,661
asset	200	200	200	400	400
Invested capital	200	200	19,591	50,282	54,061

Working capital is the money required for business activities. It is calculated by deducting purchase obligations from the total amount of trade receivables and inventory assets and is usually linked to changes in sales (Table 7).

Table 7: Working capital requirement ratio (unit: One million won, %)

Division	Accounts receivable	Inventories	Buying debt	Working capital	Sales	Working capital requirement ratio
2019	2,284,334	823,956	(426,476)	2,681,814	4,683,085	57.3
2020	2,423,688	898,179	(505,933)	2,815,934	5,182,721	54.3
		Average				55.8

Fixed assets are assets used for business activities over a long period of time to become a source of operating profit, and it is assumed that no capital expenditures are incurred except for acquiring research equipment related to the company's patent technology development.

3.6. Discount rate and present price coefficient

The discount rate is a conversion rate that converts future cash flows to present value, and at the same time, it is an interest rate that calculates the cost of capital, which is the consideration used for invested capital. The cost of debt capital refers to the interest expense, etc. paid by a company on funds borrowed from financial institutions, etc. In this evaluation, the corporate bond yield was reported as a substitute for the capital of others, and the three-year bond distribution yield of 7.78% as of the evaluation base date was applied. The cost of equity capital refers to the consideration of an investor (shareholder) for capital investment. In this evaluation, 8.25%, which is 1.5 times that of the bank term deposit as of the evaluation base date, was applied (Bodie et al., 2012).

Since the company is in the early stages of its founding, the capital composition ratio as of the valuation base date cannot be regarded as a normal ratio, so the sector average capital composition ratio is considered a substitute for the optimal capital composition and applied to calculate the discount rate (weighted average cost of capital). On the other hand, if a company's dependence on others' capital is excessively high and exceeds the critical level (average capital composition ratio), it is more likely to face financial risk, leading to an increase in capital procurement costs (Mohammed, 2019). Therefore, when the company's dependence on debt capital is higher than the sector average, the financial stability adjustment factor is applied. Since the dependence on debt capital in Z does not exceed 59.51%, the sector average ratio, the financial stability adjustment factor is applied as 1. The discount rate used for technology valuation refers to the weighted average cost of capital costs for individual capital, and the calculation details are as follows (Table 8):

$$Discount\ rate = [(cost\ of\ debt) \times ratio\ of\ debt\ to\ equity + cost\ of\ equity \times cost\ of\ equity) \times financial\ stability\ adjustment\ factor$$

Table 8: Working capital requirement ratio

Division	Z	Industry average	Cost by source	Discount rate (weighted average capital cost)
Borrowed capital	50%	89.51%	7.78%	7.97%
owner's capital	50%	40.49%	8.25%	

The capital composition cost of Z Co., Ltd. is calculated by reflecting the amount of the warranty application in progress as of the base date.

3.7. Residual value

The residual value is the conversion of excess profit expected after the estimation period. As the estimation period is five years, the performance after 2025 is added to the residual value. The residual value is evaluated assuming that the performance in 2024 will continue. After 2026, it is assumed that there will be no excess return opportunities and profit growth from new investments (Singh, 2019).

$$Residual\ value = Excess\ profit\ in\ 2025 / discount\ rate \times present\ price\ coefficient$$

$$= 2{,}975/0.0797 \times 0.68153 = 25{,}440\ million\ won$$

3.8. Technology valuation

The technology value evaluation was calculated assuming that the product development was successfully completed based on intellectual property rights and that sales would be generated to the rights holder during the future life of the product. This is on the premise that the holding company continues product development, prototype production, product mass production, and sales according to the business plan, and does not reflect differences that occur as the business entity changes (Table 9).

Table 9: Technology valuation table (unit: One million won)

Division	2021	2022	2023	2024	2025	Total
Sales	-	-	34,752	89,395	96,168	220,315
Domestic sales	-	-	14,400	29,664	47,554	91,618
Overseas sales	-	-	20,352	59,731	48,614	128,697
Cost of sales	-	-	20,415	52,515	56,494	129,424
Gross profit	-	-	14,337	36,880	39,674	90,891
Selling expenses and administrative expenses	2,000	4,200	10,707	27,543	29,629	74,097
Operating income	(2,000)	(4,200)	3,3630	9,337	10,045	16,812
(-) Income tax, etc.	-	-	1,118	2,876	3,094	7,088
(+) depreciation expense	67	133	200	266	333	999
(-) capital expenses	8	16	1,561	4,008	4,309	9,902
Excess profit	(1,941)	(4.083)	1,151	2,719	2,975	829
Present worth factor	0.92618	0.85782	0.79449	0.73585	0.68153	-
Present value	(1,798)	(3,502)	914	2,001	2,028	(357)
Residual value	-	-	-	-	-	25,440
Total						25,083
Technical contribution						0.26
Technical value						6,522

According to the method described above, the technology value transferred from the Korea Biotechnology Research Institute to the spin-off company Z was evaluated, and the results are summarized in Table 10. As a result of estimating and converting the excess profit for the future for five years, the performance for the estimated period is 829 million won, and the residual value, which is the performance for the subsequent period, is 25,440 million won. Therefore, the total value of the converted excess profit is KRW 25,083 million, of which the contribution of technology assets is estimated at 0.26, and the total technology value is KRW 6,522 million.

Table 10: Technology value results (unit: One million won)

Excess profit over estimated period	829
Residual value	357
Sum	25,083
Technology contribution (%)	0.26
Technology value	6,522

4. Conclusion

This study is the objectivity of capitalization of intellectual property rights for the collective security system of intellectual property rights, unification of technology and credit evaluation, asset structure change, M&A, transaction price calculation for transfer transactions and commercialization, strategy, financial support, investment decision making, litigation, etc. In order to secure rationality, it is meaningful to establish a revenue approach evaluation model. Through this, it is expected that the contents of this study can be actively used in intellectual property management strategies for corporate sustainability in the 4th industrial revolution economy. In the 4th industrial revolution economy where intellectual property is evaluated as a very important factor for creating the enterprise value, the fair value for the enterprise value should be preceded by the proper valuation of the intellectual property. Among the various valuation techniques, the profit approach is mainly used for the valuation of intellectual property due to the importance of future cash flow, and it is a very useful analytic method not only for valuation but also for investment value analysis of general investment assets.

In this study, it is assumed that domestic firms receive intellectual property from foreign companies intellectual property. The valuation analysis is based on the financial statements such as the business plan of the domestic company and the income statement, the statement of financial condition and manufacturing cost statement, the balance sheet, the statement of retained earnings, and the statement of loss. Specifically, the operating profit is calculated from the gross profit, the corporate tax and capital cost are taken into consideration, the depreciation cost is increased or decreased, the excess profit is calculated, and the current value is obtained by multiplying the current value. We propose a revenue approach model and a case analysis to obtain the ultimate value of intellectual property by multiplying the contribution by this factor.

It is not easy to predict future cash flows and estimate various financial statements, and there is a limit to the possibility that the evaluator will be subject to the estimation of the appropriate discount rate. More detailed and partial complementary research classified by industry size is to be left as a future study.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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