ISSN 2616-5902 Vol. 6, Issue 3: 23-31, DOI: 10.25236/AJBM.2024.060303

Research on the Core Basic Indicators of Industrial Innovation Ability Evaluation

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Abstract: *Evaluation indicators of industrial innovation ability is the basis for objective and accurate evaluation of industrial innovation ability. This paper aims to screen the core basic indicators of industrial innovation ability evaluation through theoretical analysis. From the perspective of input-output, the evaluation framework of industrial innovation ability is established through theoretical analysis, and the selection principle of core basic indicators is proposed. First, the basic indicator system of industrial innovation ability evaluation is constructed, and then the core basic indicator is selected by comparing the advantages and disadvantages of similar evaluation indicators. Finally, some suggestions on the evaluation of industrial innovation ability are put forward.*

Keywords: *Industry, Innovation, Evaluation, Indicators*

1. Introduction

Through the construction of evaluation indicator system, it is of great significance to guide industrial innovation activities by objectively and accurately evaluating industrial innovation ability. Industrial innovation includes technological innovation, business model innovation, management innovation and so on. The research object of this paper is industrial technological innovation, hereinafter referred to as industrial innovation. How to define industrial innovation and innovation ability? Which indicator should be used as the basic indicator of industrial innovation ability evaluation? Which of the same kind of basic indicator can be more accurately evaluated as the core indicator of industrial innovation ability. These are several questions discussed in this paper. First of all, from the perspective of input and output, the evaluation framework of industrial innovation ability is established through theoretical analysis and the selection principle of basic indicator is established. On this basis, the dimensions of industrial innovation ability evaluation are determined and the basic indicator system of industrial innovation ability evaluation is constructed. Then through the analysis and comparison of the advantages and disadvantages of each basic indicator, the core basic indicator of industrial innovation ability evaluation is screened out. Finally, several suggestions are put forward for the evaluation of industrial innovation ability.

2. Literature Review

Since the Chinese government proposed the development strategy of building an innovative country in 2006, the issue of industrial innovation ability evaluation has attracted widespread attention. Many scholars and authoritative institutions have studied this issue from different theoretical perspectives. The relevant literature can be divided into two categories. One category evaluates industrial innovation ability from the overall perspective, puts forward the indicator system of evaluating industrial innovation ability, and evaluates industrial innovation ability on this basis. For example, the evaluation indicator system of biotechnology industry innovation ability released by the Ministry of Science and Technology of China [1] evaluates the innovation ability of biotechnology industry from five aspects, including innovation environment, innovation input, network organization, core ability and innovation effect. The Organization for Economic Cooperation and Development (OECD) [2] compares the innovation level of ICT industry (information and communication technology industry) in major economies in the world through the research and development intensity, the proportion of the number of enterprises carrying out innovation activities, the proportion of PCT patent applications, and the proportion of trademark applications. Li Haichao [3] constructs the evaluation indicator system of ICT industry growth ability from three aspects of communication infrastructure, industrial performance and industrial growth potential. Wen Xiaohui et al. [4] construct the evaluation indicator system of biomedical industry

ISSN 2616-5902 Vol. 6, Issue 3: 23-31, DOI: 10.25236/AJBM.2024.060303

innovation ability from four levels of country, region, industry and enterprise. He Ping [5] constructed the evaluation indicator system of technological innovation ability of high-tech industry from the perspective of innovation input and innovation output. Liu Yufen et al. [6] used rough intensive simplified method to construct the evaluation indicator system of high-tech industry innovation ability in western China. Another kind of literature evaluates the industrial innovation ability with a certain innovation ability evaluation indicator from a local perspective. For example, Duan Dezhong [7] compared the innovation ability of China and the United States in equipment manufacturing and information and communication industry based on patent indicator. There are relatively few literatures of this kind. In general, the existing researches construct the evaluation indicator system of industrial innovation ability from different perspectives, and evaluate the industrial innovation ability through a certain statistical analysis method [8], which plays a certain role in promoting the formulation of industrial innovation policy and the improvement of industrial innovation ability, but there are deficiencies in the following three aspects: first, the theoretical discussion of the evaluation of industrial innovation ability is insufficient, and few literatures analyze from the theoretical level to construct the evaluation indicator system of innovation ability; second, there is no special discussion on the selection of basic indicators. Absolute indicator (total indicator) is the basis for constructing relative indicators, which can be called basic indicator. It is necessary to discuss the selection of basic indicators. Third, the core indicators are not selected through the comparison of the pros and cons of similar indicators, resulting in inaccurate evaluation results of industrial innovation ability. The paper attempts to make up for the deficiencies in the above three aspects of the evaluation of industrial innovation ability, and provide a theoretical basis for the objective and accurate evaluation of industrial innovation ability.

3. Theoretical analysis of the evaluation of industrial innovation ability

The definition of industrial innovation and industrial innovation ability is the basis for the construction of the industrial innovation indicator system. Based on the existing research on the definition of industrial innovation and industrial innovation ability, industrial innovation is defined as the activity of using economic resources to produce innovation results and using innovation results to improve economic efficiency and achieve the improvement of industrial competitiveness with enterprises in the industry as the innovation subject, with the cooperation and support of relevant research institutions, schools and governments. Industrial innovation ability is the ability to invest economic resources and produce innovation results. Enterprise innovation is the micro basis of industrial innovation, and many interrelated enterprise innovations constitute industrial innovation.

From the process of enterprise innovation activities, innovation includes two stages: innovation input and innovation output.

From the perspective of input, capital, talents and innovation infrastructure are the guarantee of enterprise innovation. From the perspective of the source of enterprise innovation, innovation can be realized through its own or joint research and development activities with other enterprises, or through the purchase of the research and development achievements of other enterprises and institutions. Therefore, the expenditure of research and development funds and technology acquisition expenses should be regarded as the investment in technological innovation. From the perspective of the realization of the commercial value of research and development achievements, research and development investment includes not only the investment in research and development activities to obtain research and development achievements and realize technological innovation, but also the investment in the use of research and development achievements in production to improve economic benefits. The former corresponds to the expenditure of research and development funds, and the latter corresponds to the technological transformation expenses.

From the perspective of output, patents and technologies are the main achievements of enterprise innovation, and are reflected in the form of product value and economic benefits. The innovation achievements formed by enterprises through research and development activities exist either in the form of intellectual property rights with patents as the carrier, or in the form of technical secrets. New products are the main carriers of innovation achievements such as patents and technologies, and should be used as the dimension to evaluate the ability of industrial innovation. The ultimate goal of enterprise innovation activities is to achieve more profits, and operating profits are the main indicators of enterprise profits.

Innovation results not only lie in quantity, but more importantly in quality. The innovation results are graded according to certain standards and given corresponding weights according to the grades, as the

ISSN 2616-5902 Vol. 6, Issue 3: 23-31, DOI: 10.25236/AJBM.2024.060303

basis for measuring and evaluating the level of innovation. For example, the value of invention patent is higher than that of utility model patent.

Evaluation indicators can be divided into absolute indicators (total indicators) and relative indicators. Absolute indicators are the basis for building relative indicators, which can be called basic indicators. The paper mainly examines the absolute indicators as the basic indicators for evaluating industrial technological innovation ability, providing a basis for further building relative indicators for evaluating industrial technological innovation ability.

4. Principles of selecting core basic indicators for industrial innovation ability evaluation

4.1 Basics

Basics refers to the indicator as the basis for building other indicators. Indicators can be divided into absolute indicators (total indicators) and relative indicators, and absolute indicators are the basis for building relative indicators. For example, the R&D expenditure indicator is a total indicator, and the per capita R&D expenditure is a relative indicator built on the basis of the R&D expenditure indicator.

4.2 Representativeness

Adopt representative indicators that can accurately reflect industrial innovation ability. The standard for measuring the merits and demerits of the indicator system does not lie in the number of indicators, but in the quality of indicators. For example, innovation input and innovation output are core indicators for measuring industrial innovation ability, while the innovation environment, such as innovation infrastructure and policy support, although plays an important role in industrial innovation, is an indirect influencing factor and should be used as peripheral indicators. For another example, compared with the number of patent applications and the number of patent authorizations, the number of patent authorizations can better reflect the innovation ability of industries. For another example, invention patents have higher innovation value than utility model patents, so they are more representative.

4.3 Accessibility

The data of the indicators used are the data that can be obtained through official or authoritative institutions. For indicators that are difficult to obtain data or have high costs to obtain data, try not to use them. From the perspective of time series, the time series of indicator data should be continuous. If the indicator data is only available in 1 year or several years, it does not have continuity and cannot be used for dynamic economic analysis.

4.4 Comparability

Horizontal comparability of indicator data. For example, if the indicator data of an industry in different regions or different countries are consistent or basically consistent, the innovation evaluation indicator included in international standards should be adopted to ensure the international comparability of indicator data.

Based on the above theoretical analysis and indicator selection principles, the basic indicator system of industrial innovation ability evaluation is constructed from the perspective of input and output, and the advantages and disadvantages of similar indicators are discussed, and the core basic indicators for evaluating industrial innovation ability are finally screened out.

5. The basic indicator system of industrial innovation ability evaluation from the perspective of input

The basic indicator system of industrial innovation ability evaluation from the perspective of input is constructed from the two dimensions of human resource input and capital input. (See Table 1)

5.1 Human resource input

According to the theoretical analysis and indicator selection principles, and with reference to the human resource input indicators in existing literature, the number of R&D personnel or the full-time

ISSN 2616-5902 Vol. 6, Issue 3: 23-31, DOI: 10.25236/AJBM.2024.060303

equivalent of R&D personnel is taken as the first-level indicator of human resource input.

The number of R&D personnel refers to the personnel engaged in basic research, applied research and experimental development activities. The full-time equivalent of R&D personnel refers to the sum of the workload of full-time personnel and the workload of part-time personnel converted into actual working hours. Obviously, the full-time equivalent of R&D personnel can more accurately reflect the human resource input of R&D activities than the number of R&D personnel, so the "full-time equivalent of R&D personnel" is taken as the core indicator of the dimension of human resource input. Only when the full-time equivalent of R&D personnel is not available, the number of R&D personnel is used as a substitute indicator. In addition, according to the role of R&D personnel in R&D, they are divided into project R&D personnel, project management personnel and service personnel. They can be used as secondary indicators for more detailed analysis.

5.2 Capital investment

According to the principles of theoretical analysis and indicator selection, and with reference to the capital investment indicators in existing literature, the R&D expenditure, new product development expenditure, technology acquisition cost and technological transformation cost are taken as the first-level indicators of capital investment.

The capital investment in technological innovation of an enterprise can be the capital investment in its own R&D activities (or joint R&D activities with other enterprises or institutions), or the capital investment in directly purchasing the R&D achievements of other enterprises or institutions. The former includes R&D expenditure and new product development expenditure, while the latter refers to technology acquisition cost. Technical transformation costs are between the two, including both independent research and development investment and external purchase.

R&D expenditure refers to the expenditure of an enterprise for research and development activities. The indicators matched with the indicator of R&D expenditure can be operating income and other indicators to reflect the intensity of research and development activities; the indicator of R&D expenditure can also be matched with patents and other innovation achievement indicators to reflect the input and output effect of innovation activities. From the perspective of use, R&D expenditure can be divided into internal expenditure of R&D expenditure and external expenditure of R&D expenditure, which can be used as secondary indicators for more detailed analysis.

New product development expenditure refers to the expenditure for new product development. This indicator collects R&D expenditure from the perspective of new product development, which has a large overlap with R&D expenditure. This indicator can be matched with the indicator of new product sales revenue to reflect the input and output effect of innovation activities. Because the definition of new products is ambiguous (see the analysis of new product sales revenue indicator below), the expenditure of new product development should be used as a substitute for the indicator of R&D expenditure.

Technology acquisition costs refer to the expenditure of an enterprise to purchase technology from home and abroad. Technology acquisition includes the expenditure on purchasing technical data such as product design, process flow, drawings, formula, patent, and the expenditure on purchasing key equipment, forming the intangible or tangible assets of an enterprise. Technology acquisition is the purchase of enterprises' research and development achievements from other enterprises, schools or research institutions, and is the main way of technology diffusion [9].This indicator reflects the transfer of original technological innovation achievements and the realization of the commercial value of innovation achievements. Technology acquisition costs can be further divided into two sub-indicators: technology introduction (purchasing technology from abroad) and technology purchase from domestic sources. Technical transformation costs refer to the expenditures incurred by enterprises for technical transformation. Technical transformation refers to the substitution of advanced technology and equipment for backward technology and equipment, so as to improve product quality, promote product upgrading, and comprehensively improve economic efficiency. This indicator includes the elements of independent innovation of enterprises, as well as the purchase and use of external innovation achievements through equipment purchase and other means. Technical transformation costs reflect the expenditures incurred by enterprises to improve productivity and reduce production costs through the use of research and development achievements with technology and equipment as carriers. For example, the expenditures incurred by using industrial robots to replace human labor in the production process. From the perspective of application scope, this indicator is aimed at the production process, and is only applicable to the manufacturing industry, not the service industry.

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Based on the above analysis, the indicators of "R&D expenditure" and "new product development expenditure" are both statistical indicators of the enterprise's own R&D capital investment, but they are collected from different perspectives. The "R&D expenditure" is taken as the core basic indicator of the industrial innovation ability evaluation of the capital investment dimension, and the "new product development expenditure" is taken as the substitute indicator of the "R&D expenditure". The "technology acquisition cost" and the "technology transformation cost" are taken as the core basic indicators of the industrial innovation ability evaluation of the capital investment dimension from the perspective of technology transfer and technology application.

Table 1: Basic indicator system for industrial innovation ability evaluation from the perspective of input

Dimension	First-level indicator	Unit	Second-level indicator	unit
Human resource input	Number of R&D personnel	person	Number of project research personnel	person
			Number of R&D management and service personnel	person
	Total time equivalent of R&D personnel	person-year	Total time equivalent of project research personnel	person-year
			Total time equivalent of project research personnel	person-year
Capital input	R&D expenditure	thousand CNY	Internal expenditure of R&D funds	thousand CNY
			External expenditure of R&D funds	thousand CNY
	New product development expenditure	thousand CNY		
	Technology acquisition expenses	thousand CNY	Technology import expenditure	thousand CNY
			Expenditure on Purchase of Technology from Domestic Sources	thousand CNY
	Technical Transformation Expense	thousand CNY		

6. The basic indicator system for the evaluation of industrial innovation ability from the perspective of output

The basic indicator system for the evaluation of industrial innovation ability from the perspective of output is constructed by taking patents, academic papers, new products and innovation results as the four dimensions of industrial innovation ability evaluation. (See Table 2)

6.1 Patents

According to the principles of theoretical analysis and indicator selection, and with reference to the patent indicators in existing literature, the number of patent applications, the number of patent authorizations and the number of effective patents as the first-level indicators of the patent dimension.

Patents grant the patentee the right to exclusively use his invention and creation within a certain period of time. Patented technologies are public and protected by law, and patents are one of the main forms of intellectual property rights.

From the perspective of the legal status of patents, they are divided into the number of patent applications, the number of patent authorizations and the number of effective patents. Among them, the first two are flow indicators, and the third is a stock indicator.

From the perspective of patent types, in China, patents are divided into invention patents, utility model patents and design patents. Among them, the authorization standard of invention patents is the highest, the process is time-consuming, the degree of innovation is the highest, and therefore the most valuable. From the perspective of innovation quality, it is more appropriate to measure innovation results with the number of invention patents.

Compared with the number of patent applications and the number of authorizations, since patent

ISSN 2616-5902 Vol. 6, Issue 3: 23-31, DOI: 10.25236/AJBM.2024.060303

applications may not be granted, the number of patent authorizations is a more appropriate evaluation indicator for innovation ability than the number of patent applications. However, using patent authorization number as an innovation indicator also has disadvantages, as the granted patents may not be able to be transformed into commercial value through application. In China, there are fewer problems in the patents owned by enterprises, while there are more problems in the patents owned by research institutions and universities. The market transformation of research and development results is a problem that needs to be solved.

Effective patents are patents authorized by domestic and foreign intellectual property administrative departments and within the validity period, which are the accumulation of authorized patents over the years. As a flow indicator, the patent authorization number reflects the new innovation achievements of the industry and is more suitable for measuring the active degree of innovation. As a stock indicator, the effective patent number reflects the accumulation of industrial innovation achievements and is more suitable for measuring the innovation strength. The number of patent authorization or effective patents should be used to measure industrial innovation ability according to the evaluation objectives.

Based on the above analysis, the "number of invention patent authorization" and "the number of effective invention patents" are the core basic indicators of industrial innovation ability evaluation in the patent dimension, and the two are complementary indicators.

6.2 New products

According to the principles of theoretical analysis and indicator selection, and with reference to the capital input indicators in the existing literature, the sales revenue of new products is the first-level basic indicator of the new product dimension. New products refer to products produced by new technology or new design, or products with significant improvements in raw materials, processes and other aspects compared with the original products[10].Innovation results, whether in the form of patents or technical secrets, whether they are obtained by enterprises through research and development activities, or purchased from outside in the form of technology acquisition, will ultimately realize their commercial value through the sale of products. Therefore, the sales revenue of new products is a key indicator reflecting innovation ability. There are the following problems in using the sales revenue of new products as an indicator to measure innovation ability: first, new products are a relative concept that is constantly updated, and new products need to be defined according to the evaluation objectives of innovation ability and the development situation of industry technology. Second, from a qualitative perspective, the degree of "new" is ambiguous and not easy to measure accurately. On the premise of solving the above problems, the sales revenue of new products is included in the core basic indicators of the industrial innovation ability evaluation of the new product dimension.

6.3 Innovation efficiency

Table 2: Basic indicator system for industrial innovation ability evaluation from the perspective of output

Dimension	First-level indicator	Unit	Second-level indicator	unit
patent	patent applications	piece	Number of utility model patent applications	piece
			Number of invention patent applications	piece
	granted patent	piece	Number of utility model patents granted	piece
			Number of invention patents granted	piece
	Number of valid patents	piece	Number of valid utility model patents	piece
			Number of valid invention patents	piece
New Product	Sales Revenue of New Product	thousand CNY		
Innovative Achievements	Operating Profit	thousand CNY		
	Value-Added of Industry	thousand CNY		

According to the principles of theoretical analysis and indicator selection, and with reference to the innovation efficiency indicators in existing literature, the operating profit and industrial added value are

ISSN 2616-5902 Vol. 6, Issue 3: 23-31, DOI: 10.25236/AJBM.2024.060303

taken as the first-level basic indicators of the innovation efficiency dimension. Enterprises' innovative activities, either by improving the technical content and added value of products, or by reducing production costs through process improvement, should be reflected in innovative business performance. From the perspective of enterprise owners, operating profit is the main indicator of profitability; from the perspective of the income of all production factors, added value is the main indicator of input-output performance. Operating profit is the profit of operating income after deducting operating costs and expenses. Industrial added value is the value of output after deducting intermediate inputs in the production process, indicating the value created by various factors such as labor and capital input in the production process. Operating profit measures the profitability of an industry from the perspective of enterprise owners, while industrial added value measures the profitability of an industry from the perspective of all production factors. Both operating profit and industrial added value can be used as the core basic indicators to measure the effectiveness of innovation, and they can be replaced by each other.

7. Core basic indicators of industrial innovation ability

Based on the above analysis, the core basic indicators of industrial innovation ability evaluation from the perspective of input and output are obtained respectively. (See Table 3, Table 4) Core basic indicators of industrial innovation ability evaluation from the perspective of input include two evaluation dimensions: human resource input and capital input. The core basic indicators of human resource input include two indicators: the total time equivalent of R&D personnel and the number of R&D personnel, among which the number of R&D personnel is a substitute indicator for the total time equivalent of R&D personnel. The total time equivalent of R&D personnel includes two sub-indicators: the total time equivalent of project research personnel and the total time equivalent of R&D management and service personnel. The core basic indicators of capital input include four indicators: R&D expenditure, new product development expenditure, technology acquisition cost and technological transformation cost. Among them, the R&D expenditure indicator includes two sub-indicators: internal expenditure of R&D expenditure and external expenditure of R&D expenditure, and the technology acquisition cost indicator includes two sub-indicators: technology introduction expenditure and expenditure on purchasing technology from China. The technological transformation cost indicator is only applicable to the manufacturing industry.

Table 3: The core basic indicators for industrial innovation ability evaluation from the perspective of input[1]

Dimension	Core and basic indicators	Unit	Meaning
Human resource input	★Total time equivalent of R&D personnel	Person-year	Sum of the workload of full-time workers and the workload of part-time workers converted into actual working hours
	☆Number of project research personnel	Person	Personnel engaged in basic research, applied research and experiment and development activities
Capital input	★R&D expenditure	thousand CNY	Expenditure of an enterprise for research and development activities
	☆New product development expenditure		Expenditure for the development of new products
	★Technology acquisition expenses	thousand CNY	Expenditure for the purchase of technology from home and abroad
	★Technical Transformation Expense	thousand CNY	Expenditure for internal technological upgrading

The core basic indicators of industrial innovation ability evaluation from the perspective of output include three evaluation dimensions: patents, new products and innovation effect. The core basic indicators of patents include the number of invention patents and the number of effective invention patents. As complementary indicators, they evaluate industrial innovation capacity from the perspective of flow and stock respectively. As complementary indicators, they evaluate industrial innovation capacity from the perspective of profitability. The core basic indicator of new products includes only one indicator- sales revenue of new products. The core basic indicators of innovation effectiveness include

[1] ★represents the core basic indicator,☆represents the substitute indicator of the core basic indicator.

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the operating profit and the industrial added value. As substitute indicators, they measure industrial innovation capacity through profitability from the perspective of enterprise owners and all production factors.

Table 4: The core basic indicators for industrial innovation ability evaluation from the perspective of output[2]

Dimension	Core and basic indicators	Unit	Meaning
Patent	★Number of invention patents granted	piece	Number of invention patents applied by the enterprise and authorized by intellectual property administrative departments at home and abroad
	★Number of valid invention patents	piece	Number of invention patents authorized by intellectual property administrative departments at home and abroad and within the validity period
New Product	★Sales Revenue of New Product	piece	Sales revenue realized by selling new products
Innovative Achievements	★Operating Profit	piece	Sales revenue realized by selling new products
	★Value-Added of Industry	thousand CNY	Value of output from production process minus intermediate inputs

8. Suggestions for the Evaluation of Industrial Innovation Ability

8.1 Relative Indicators Based on the Basic Indicators

In many cases, relative indicators can better measure industrial innovation ability than the absolute indicators as basic indicators. It is necessary to build relative indicators based on the absolute indicators. For example, the full-time equivalent indicator of R&D personnel in human resource input is combined with the number of industrial employees to form the full-time equivalent indicator of R&D personnel per ten thousand people, which is used as an indicator to measure human resource input. The R&D expenditure in capital input is combined with the industrial operating income or industrial added value to form the R&D intensity indicator, which measures industrial innovation ability from the perspective of capital input. For another example, the number of invention patents is combined with the number of industrial employees to form the number of invention patents per million people, which measures industrial innovation ability from the perspective of output.

8.2 Establish an Appropriate Core Indicator System for Industrial Innovation Ability According to Research Purpose

There is no unique evaluation standard for industrial innovation ability, nor a unique core indicator system. The definition of industrial innovation ability and the research purpose play a decisive role in the construction of the core indicator system for industrial innovation ability. For example, if the overall evaluation of industrial innovation ability is made, the indicators of innovation input and innovation output should be included in the evaluation indicator at the same time. For another example, if the efficiency of industrial innovation is taken as the evaluation target, the "output/input" relative indicator is constructed based on the indicator of innovation input and innovation output. For another example, if the cumulative innovation ability of the industry is evaluated, the stock indicator of patents -- the number of effective patents is selected. If the active degree of industrial innovation activities in a specific period is evaluated, the flow indicator of patents - the number of patent authorizations is selected. After the overall framework of industrial innovation ability evaluation is established, the indicators are subdivided at different levels, and the core indicator system of industrial innovation ability is constructed according to the principles of representativeness, availability and comparability of indicator data.

8.3 Expand the evaluation dimension of industrial innovation ability, and add peripheral indicators on the basis of core evaluation indicators

Innovation environment and network organization can be used as the expanded dimension of industrial innovation ability evaluation. The innovation environment includes government funding and industrial innovation policies, innovation infrastructure (such as innovation platforms such as laboratory

[2] ★represents the core basic indicator.

ISSN 2616-5902 Vol. 6, Issue 3: 23-31, DOI: 10.25236/AJBM.2024.060303

or engineering technology research center, and industrial innovation park). Network organization refers to domestic industry-university-research cooperation and international cooperation, such as the transformation of scientific research achievements, technology introduction and technology export. Expanding the evaluation dimension of industrial innovation can more comprehensively and effectively evaluate the innovation ability of the industry.

8.4 Establish corresponding evaluation indicator system of innovation ability according to the characteristics of different industries

Different industries have different characteristics in innovation, so it is necessary to build an appropriate evaluation indicator system for innovation ability according to the industry studied. For example, compared with the manufacturing industry and the service industry, the technical transformation cost indicator is mainly used to measure the innovation ability of the manufacturing industry. Another example is the ICT manufacturing industry and the software industry, which both belong to the ICT industry (information and communication technology industry). The patent number indicator can be used to measure the innovation of the ICT manufacturing industry, but can not be used to measure the innovation of the software industry.

9. Conclusion

This paper analyzes the indicators representing industrial innovation ability from the perspective of input and output, and selects the core basic indicators of industrial innovation ability through comparison. From the perspective of input, it is divided into two dimensions of human resource input and capital input, including six core basic indicators: the total time equivalent of R&D personnel, the number of R&D personnel, R&D expenditure, new product development expenditure, technology acquisition cost and technical transformation cost. From the perspective of output, it is divided into three dimensions of patents, new products and innovation results, including five core basic indicators: the number of invention patents granted, the number of effective invention patents, the sales revenue of new products, operating profit and industrial added value.

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