

## To Delve into Establishment of Science Popularization Industry Statistical System

WeiHong Ren<sup>1</sup>, Guangbin Liu<sup>2</sup>

<sup>1</sup>China Research Institute for Science Popularization, Beijing, P.R.China

<sup>2</sup>Beijing Institute of Petrochemical Technology, Beijing, P.R.China

**Abstract**--This paper analyzes the necessity of establishing statistical indicator system of Chinese science popularization industry on the basis of absorbing and drawing lessons from existing researching achievements of science popularization industry, preliminarily defines the industry classification of science popularization industry based on national economic industry classification standard (GB/T754-2011), puts forward a preliminary and tentative thought concerning establishing statistical system of Chinese science popularization industry, and comes up with constructive opinions and references for the establishment and improvement of statistical system of Chinese science popularization industry.

### I. INTRODUCTION

In March 2006, the Chinese government issued Outline of the National Scheme for Scientific Literacy (2006-2010-2020). One of the important measures put forward therein is “establishing preferential policies and relevant specifications, actively cultivating and fostering market atmospheres and promoting the development of science popularization culture industry” so as to improve scientific literacy of citizens more effectively. Since then, promoting the development of science popularization industry has been included into relevant national development outline and become a nationwide action promoted by the state[1].

Science popularization industry is an economic form of science popularization, existence form of science popularization economy, product of detailed division of labor in science popularization production, increase of science popularization production mode, transition of circulation and sale carrier of science popularization and increasing consumer demands of science popularization, as well as an industry with research and development, production and operation, distribution and circulation and consumption [2][3]. statistical work of science popularization industry is still falling short of the requirements of the development of science popularization industry, in that the number of research into it is still little, what is more, what we understand something about science popularization industry is conceptually vogue, not so specific, therefore, it proves to be difficult for us enter into a scientific , unified and specific understanding of it.

In order to meet the national grand blueprint for the development of science popularization industry, it is urgent to draw policies of the development of science popularization industry, imperative to obtain a clear idea of the development status of science popularization industry ,and carry out statistical work regarding science popularization industry. The establishment of statistical system of science

popularization industry and its basic framework tailoring to the need of the era and economic development is a huge and systematic project which requires joint efforts of people from all walks of life. This paper puts forward some preliminary opinions on the reason why it is in an urgent need to carry out statistics of science popularization industry, some tentative thoughts for establishing statistics of science popularization industry, difficulties and problems in the implementation of statistics of science popularization industry and suggestions on how to do a great job in statistical work concerning science popularization industry.[4][5]

### II. ESTABLISHMENT OF STATISTICAL SYSTEM OF SCIENCE POPULARIZATION INDUSTRY

To establish statistical system of science popularization industry requires us to define the limited scope of statistics of science popularization industry, thus determining statistical indicators of science popularization industry and specifying data source and investigation method.

#### A. Scope of statistics

Hu Shenghua put forward the concept of “science popularization industry” earlier in relevant research field in China . He analyzed the influence of new situation on traditional science popularization products and thought that it was required to improve mechanism according to market discipline and enhance the attraction and competitiveness of science popularization products.[6] Then, the concept of “science popularization” has been gradually accepted by domestic researchers and relevant researches have been gradually conducted.

In the research of science popularization industry, the definition of the concept of science popularization industry is a basic theoretical issue that we must face up to. Due to different research perspectives, there are different opinions on its definition. Currently, the academic world has not reached a consensus on the definition of science popularization industry. It is mainly defined from two research perspectives - science popularization culture industry and science popularization industry:

Lao Hansheng defined science popularization culture industry as an industry emerging to meet people’s need of science popularization culture and consumer demand of science popularization culture from the perspective of culture industry. The main function of this industry is to meet people’s consumer demand of science popularization culture. The purpose of meeting people’s demand of science popularization culture is to improve the quality of people’s

life.[7] This definition highlights that science popularization industry is an industry emerging to meet the cultural need and consumer demand of science popularization based on the public requirements and highlights the social public demand foundation for science popularization industry.

Based on the analysis of features of science popularization industry, Ren Fujun and Zhang Yizhong defined science popularization industry as follows: science popularization industry refers to activities providing science popularization products and services for the nation, society and public based on market mechanism and under the premise of meeting demands of science popularization market and the collection of activities related to these activities; it is an industry composed of four links - creation, production, transmission and consumption of science popularization products which spreads scientific knowledge, thoughts, spirits and methods in the society, creates wealth, provides employment opportunities and promotes the improvement of citizens' scientific literacy with science popularization contents and service with certain cultural foundation as core products.[8] This definition comprehensively reveals the market demand foundation, market operating mechanism, constitution links

and content and purpose of development of science popularization industry.

According to connotations of science popularization industry, the scope of statistics of science popularization industry is defined as a collection of enterprises and institutions specializing in science popularization activities and providing products or services. According to the scope of statistics of science popularization industry, this paper puts forward the industry classification of science popularization industry. Its subject is industries in national economic industry classification (GB/T4754-2011).[9] It is important to note that the industry classification of science popularization industry does not perfectly fit with the four-level classification in the current national economic industry classification. In the four-level classification, only some belong to science popularization industry. Let's take book publishing industry as an example. Only science popularization books among the publishing books belong to science popularization industry. This paper makes a detailed explanation in table 1. Meanwhile, a comparison with international standard industry classification (ISIC/Rev.3) is also stated.[10]

TABLE 1 INDUSTRY CLASSIFICATION OF SCIENCE POPULARIZATION INDUSTRY

Category name	National economic industry code	Exploration	ISIC/Rev.3
(I) News publishing and distribution services			
1. Science popularization news service			
(1) Scientific news industry	8510	Scientific news and science popularization news gathering and editing	9220 Activities of news agency
2. Science popularization publishing service			
(1) Publishing of science popularization books	8521	Science popularization books: scientific and technological books registered in news publishing agency with official book number with non-professional personnel as reading objects and for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.	2211 Publishing of books, booklets, music score and other publications.
(2) Publishing of science popularization newspaper	8522	Science popularization newspapers such as Science and Technology Daily, Beijing Sci-Tech Report and Science Times.	2212 Newspapers, journals and periodicals
(3) Publishing of science popularization periodicals	8523	Science popularization publications issued to the society and registered in news publishing agency with official issue number or internal printing permit.	2212 Newspapers, journals and periodicals
(4) Publishing of science popularization audiovisual products	8524	Audiovisual products registered in news publishing agency and published officially for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.	2213 Publishing of recording intermedia
(5) Publishing of science popularization E-journal	8525	Science popularization publications published officially in the form of E-journal such as optical disk	2213 Publishing of recording intermedia
(6) Other science popularization publishing	8529	Other science popularization publishing oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.	2219 Other publishing activities
3. Science popularization distribution service			
(1) Wholesaling of science popularization books	5143	<i>Wholesaling of books oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	5139 Wholesaling of other domestic commodities
(2) Wholesaling of science popularization newspapers and	5144	<i>Wholesaling of periodicals oriented at the public for the purpose of popularizing scientific and</i>	5139 Wholesaling of other domestic commodities

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periodicals		<i>technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	
(3) Wholesaling of science popularization audiovisual products and E-journal	5145	<i>Wholesaling of audiovisual products and E-journal oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	5139 Wholesaling of other domestic commodities
(4) Retail of science popularization books and newspapers	5243	<i>Retail of books and newspapers oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	5239 Other retail of special stores
(5) Retail of science popularization audiovisual products and E-journal	5244	<i>Retail of audiovisual products and E-journal oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	5239 Other retail of specialized stores
<b>(II) Science popularization broadcast television and film services</b>			
<b>1. Science popularization broadcast television service</b>			
(1) Science popularization broadcast	8610	Programs broadcast by broadcasting station oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.	9213 Broadcasting and television activities
(2) Science popularization television	8620	Programs broadcast by TV station oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.	9213 Broadcasting and television activities
<b>2. Film and video recording services</b>			
(1) Science popularization film and video programming	8630	<i>Film and video programming oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	9211 Making and issue of film and video
(2) Issue of science popularization film and video program	8640	<i>Issue of film and video program oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	9211 Making and issue of film and video
(3) Science popularization film projection	8650	<i>Film projection oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	9212 Film projection
<b>(III) Science popularization culture and art services</b>			
<b>1. Science popularization literary and artistic creation and performance services</b>			
(1) Science popularization literary and artistic creation and performance	8710	<i>Literary and artistic creation and performance oriented at the public for the purpose of popularizing scientific and technological knowledge, advocating scientific methods, spreading scientific thoughts and promoting scientific spirits.</i>	9214 Drama, music and other art activities
(2) Science popularization artistic performance venue	8720	<i>Science popularization artistic performance venue</i>	9214 Drama, music and other art activities
<b>2. Library and archive services</b>			
(1) Library	8731	<i>Matching with national economic industry classification catalogue</i>	9231 Activities of libraries and archives
<b>3. Scientific and technological museum services</b>			
Scientific and technological museums	8750	Science and technology museums (science popularization venues mainly involving exhibition and education and spreading and popularizing science which are named as science and technology museum, scientific center and science palace), museums of science and technology (including scientific and technological museum, planetarium, aquarium, herbarium and comprehensive museum with natural science department etc.), science and technology museum station for teenagers, center; and non-venue science popularization bases such as zoo, arboretum, summer/winter camp base for teenagers, national geological park and scientific and technological farm etc.	9232 Activities of museums and protection of historical sites and buildings
<b>(IV) Science popularization information transmission services</b>			
<b>1. Internet information services</b>			

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(1) Science popularization internet information service	6420	Science popularization website	7240 Database activities
2. Value-added telecommunication services (cultural part)			
(1) Science popularization value-added telecommunication service	6319	Science popularization mobile phone newspaper and science popularization microblog	6420 Telecommunications
(V) Culture creativity and design services			
1. Science popularization software service			
(1) Science popularization software development	6510	Science popularization multimedia and cartoon game software development	7220 Software consultation and supply
(2) Science popularization digital content service	6591	Science popularization digital cartoon and game design and production	7220 Software consultation and supply
2. Architectural design service			
(1) Engineering investigation design	7482	Engineering investigation design service of science popularization venue	7421 Building and engineering activities and relevant technical consultation
3. Professional design service			
(1) Professional design service	7491	Science popularization venue design service	7421 Building and engineering activities and relevant technical consultation
(VI) Cultural leisure and entertainment service			
1. Scenic spot touring service			
(1) Touring scenic spot management	7852	Science popularization tourism	9233 Activities in arboretums, zoos and natural conservation areas
(VII) Auxiliary production of science popularization products			
1. Copyright service			
(1) Intellectual property service	7250	Copyright and science popularization software service	7499 Other business activities not listed otherwise
2. Cultural trade agent and auction service			
(1) Trade agent	5181	Science popularization trade agent service	7499 Other business activities not listed otherwise
3. Exhibition services			
Exhibition service	7292	Science popularization exhibition service	7499 Other business activities not listed otherwise
(VIII) Production of science popularization products			
1. Manufacturing of science popularization exhibition products			
(1) Manufacturing of special teaching instruments	4026	Manufacturing of science popularization exhibition products	3312 Manufacturing of instruments and tools for measurement, examination, inspection, navigation and other purposes, except industrial process control equipment
2. Manufacturing of science popularization toys			
(1) Toy manufacturing	2450	Manufacturing of science popularization toys	3694 Manufacturing of recreational supplies and toys

Note: italic parts in the table are defined by the author and other parts are quoted from China science popularization statistics <sup>[5]</sup>

### B. Indicator system

The setting of statistical indicators of Chinese science popularization industry should conform to the following principles:

(1) Take added value as the core and reflect the scale of operation and operating efficiency of science popularization industry. Added value is an isometric indicator of gross domestic product (GDP). It should be considered as the core indicator of statistical accounting of science popularization industry. This principle is conducive to be in line with national economic accounting system so as to reflect the gross scale of science popularization industry, development level and the contribution to the overall national economy. It is also conducive to conducting isometric comparative analysis with other industries and various industries in science popularization industry.

(2) Conform to the principle of convenience, flexibility and operability. The statistics of science popularization industry in China is still in the exploratory stage. Many corresponding supporting measures are not improved. Therefore, it is required to use existing data and realize

convenience, flexibility and operability as much as possible in the setting of statistical indicators and combine relevant categories in industry classification based on National Economy Industry Classification according to characteristics of science popularization activities.

(3) Highlight characteristics of science popularization industry. Science popularization industry has the universalities and common features of other similar industries as well as its particularities different from other industries. Therefore, it is required to take into account a series of social statistical indicators such as science popularization facilities and activities and economic indicators reflecting the economic benefit and fund activities of science popularization industry when setting statistical indicators of science popularization industry.[11]

In addition, the setting of statistical indicators of science popularization industry should not only consider the overall situation of science popularization industry, but also reveal the development law of science popularization industry and reflect its development trend and potential.

Statistical indicator system of Chinese science

popularization industry includes added value, basic indicators and analytical indicators.

(1) Added value. Added value of science popularization industry used as the core indicator can reflect the development scale and level of science popularization industry. However, this value quantity indicator alone cannot reflect the variation trend of science popularization industry from different perspectives in different aspects and at different levels and cannot assess the operational performance of science popularization industry comprehensively and objectively. Therefore, it is necessary to establish a set of statistical indicator system of science popularization industry with added value as the core to reflect the full picture of science popularization industry.

(2) Basic indicators. Basic indicators refer to those directly obtained in the investigation process through statistical investigation. For basic indicators, we investigate the development status of science popularization industry mainly in the following aspects:

Firstly, science popularization industry scale indicators, which comprehensively reflect the number and quality structure of employees and the number of units of science popularization industry.

Secondly, financial status indicators, which mainly reflect assets, income and expenses and state of operation of science popularization industry, including total value of output, total assets, net asset value, main business income, total profit, taxes, import and export trade volume, research and development input, annual average number of practitioners and average income (wage) of practitioners etc.

Thirdly, business activity indicators, which mainly reflect the situation and scale of business activities in science popularization industry. Business activity status indicators determine the collection scope according to the analysis need based on features of activities of relevant industry departments and existing statistical system and strive to reflect the basic situation of business activities of science popularization industry.

(3) Analytical indicators, which are derived from basic indicators and include the following three aspects:

Firstly, statistical analytical indicators. They can be obtained through the comparison with some basic indicators designed above for the purpose of analyzing various structural or proportional relations of science popularization industry. Multiple statistical analytical indicators can be set according to the actual need of problem analysis. The comparison requirements must be consistent and the comparison result should have practical significance.

Secondly, dynamic analytical indicators. Statistical indicator system for the development level and speed variation of science popularization industry should be established. The key to dynamic analytical indicators is to compare indicator values in different stages (different years and statistical periods). The establishment of dynamic analytical indicators for the development of science popularization industry is conducive to conducting

comparative analysis on the degree of rise and decline, development variation trend and law of science popularization industry development during different periods of time.

Thirdly, economic benefit analytical indicators. The analysis on economic benefit of science popularization industry can refer to the setting of national economic benefit indicator system, thus maintaining the consistency and comparability of economic benefit indicators of science popularization industry calculated with overall national economic benefit indicators.[10]

### *C. Investigation system*

Due to the wide coverage, large amount of work and difficulty in data collection of science popularization industry, it is required to establish a science popularization industry statistical group from top to bottom which is led by each statistical bureau and joined by each department with the cooperation of the whole society; and use the method of unified program design, questionnaire type, indicator catalogue, classification standard and data processing standard. Questionnaire type, indicator catalogue, classification standard and form filling explanations should be all formulated and issued by statistical bureau .

In terms of investigation method, we can conduct measurement and calculation for cities and counties based on economic census, establish a database and conduct annual statistics. The method is as follows: conduct comprehensive or key statistical investigation on units above a certain scale; conduct sampling survey on units below a certain scale and take economic census as samples. After further improvement, we can also conduct half-a-year statistics if permitted by conditions.

## III SEVERAL SUGGESTIONS ON THE IMPROVEMENT OF SCIENCE POPULARIZATION INDUSTRY STATISTICS

This paper makes the following suggestions according to the status and need of Chinese science popularization industry statistics currently.[12-14]

Firstly, improve understanding and awareness, include science popularization industry statistics into national statistical system, and improve Chinese science popularization statistical indicator system as early as possible. Science popularization industry statistics is not a matter that can be merely completed by a few people and individual departments. It requires the unified understanding and joint efforts of the whole society for science popularization industry. Firstly, national statistical system should get rid of the traditional concept of science popularization statistical work process and include science popularization industry statistics into the overall planning of national statistical system. Main contents of science popularization industry statistics should be completed by national statistical system rather than mainly rely on the information provided by

association for science and technology, thus guaranteeing the completeness and timeliness of data of science popularization industry, ensuring that the scope of statistics covers various categories and departments of science popularization industry and reflecting the full picture of its development.

Secondly, strengthen the awareness of value indicator and establish a series of value quantity indicators centering on added value of science popularization industry. Added value of science popularization industry is a comprehensive indicator reflecting the development status of science popularization industry as well as an important constituent of gross domestic product. As a core indicator, added value of science popularization industry can reflect the development scale and level of science popularization industry. However, this value quantity indicator alone cannot reflect the variation trend of science popularization industry from different perspectives in different aspects and at different levels and cannot assess the operational performance of science popularization industry units comprehensively and objectively. Therefore, it is necessary to establish a series of value quantity indicators centering on added value of science popularization industry.

Thirdly, institutionalize and standardize statistical investigation of science popularization industry. In the long term, it's better that statistical data of science popularization industry are directly collected by statistical department rather than indirectly provided by the Associations for Science and Technology and the Ministry of Science and Technology. To make up for the deficiency of statistical data of science popularization industry, statistical department can take the lead in conducting special investigation on science popularization industry statistics so as to provide comprehensive information such as scale, structure and benefit of science popularization industry.

Some relatively developed provinces and municipalities in science popularization industry such as Beijing, Shanghai and Anhui can be selected for pilot project of statistical system reform. We can include some industries or indicators into the existing statistical system and do not have to establish a report system alone, which can not only yield twice the result with half the effort, but also improve the need of accounting data of science popularization industry and improve national economic accounting system.

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