

Retraction

Retracted: The Impact of Smart Sensor Networks on Improving the International Competitiveness of China's Digital Economy Industry in the Context of the Smart Era

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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- [1] M. Hu, "The Impact of Smart Sensor Networks on Improving the International Competitiveness of China's Digital Economy Industry in the Context of the Smart Era," *Journal of Sensors*, vol. 2022, Article ID 2030768, 8 pages, 2022.

Research Article

The Impact of Smart Sensor Networks on Improving the International Competitiveness of China's Digital Economy Industry in the Context of the Smart Era

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At present, intelligent sensor network technology has become a popular field with a wide range of application prospects. With the continuous development of communication protocols and component technologies, the role of intelligent sensor networks in the digital economy is growing. Intelligent sensor network technology industry is a talent-intensive, knowledge-intensive, technology-intensive, technology-intensive, and technology-intensive industry; is a strategic pillar of national development; and is an important industry to promote industrial upgrading, pulling economic development. The development of intelligent sensor network technology is an inevitable choice for China to take a new road of industrialization. In today's world, the coordinated development of the environment and the economy is being increasingly valued by countries around the world. Therefore, from a macroscopic point of view, the development of intelligent sensor network technology industry has a very important role to play in improving its international competitiveness.

1. Introduction

Sensor technology, communication technology, and computer technology are the three pillars of modern information technology. Communication technology, as the “nerve,” completes the transmission of information. As the “brain,” computer technology completes the processing of information. With the rapid development of microelectronics, communication and computer technology are also developing at a rapid pace. Sensor technology, as the “senses,” is the key technology for information gathering [1].

The development of sensors can be divided into three stages: “deaf sensors,” “smart sensors,” and “network sensors.” The first stage was created by the era of analogue instruments and computers [2]. The design idea was to convert external signals into analogue voltages and currents. They were also known as “deaf sensors” because of their low functionality, low output amplitude, and low sensitivity. Since the 1970s, computer, microelectronic, and optoelec-

tronic technologies have developed rapidly, processing technologies have become increasingly sophisticated, and new sensitive materials have been widely used. The introduction of “intelligent sensors” has led to a huge change in sensing technology, which has led to a new period of development [3].

Since the 1980s, Internet communication technology has matured and has penetrated into various fields. It was during this period that computer technology and communication technology merged with each other and the Internet grew rapidly and spread almost worldwide [4]. This period also saw a precarious third step in the development of sensors. The combination of network control chips and intelligent sensors, with communication protocols cured on ROMs, resulted in “network sensors,” i.e., intelligent sensors entering the era of true information technology [5].

During these two stages of development, there is also a small sensor [6]. This type of sensor is based on existing sensing materials and uses microfabrication processes instead of

conventional processing. Micromachining technology is the key to micro-electro-mechanics (MEMS) technology, and the use of micromechanics allows for the miniaturization of micro microstructures, which in turn allows for advantages such as small size and ease of installation [7].

In the course of sensor development, we have given up the search for new and excellent sensing materials and instead digitized, networked, and miniaturized sensors to give them greater precision and reliability. At present [8], the development of sensors has entered the stage of “smart sensors,” and various smart sensors have been developed and developed to improve their performance and accuracy. However, the development of “network sensors” is still in its early stages, and there are no fully mature products at home or abroad, so this stage will become an inevitable period in its development [9].

The development of sensor technology, on the one hand, is to meet the demand for accurate measurement of unknown quantities in various fields; on the other hand, in order to adapt to the rapid development of information transmission and processing technology, the development of sensors is bound to require high precision, miniaturization, integration, digitalization, intelligence, and networking.

2. Introduction to Related Technologies

2.1. Overview of Intelligent Sensor Networks. In today’s society, sensor networks are not only cross-fertilized with various fields, but also have many key application technologies to be further developed. With the continuous development of communication technology, battery technology, and micromanufacturing technology, the performance of sensor nodes is constantly improving. It has the following distinguishing features: (1) data-based peer-to-peer networks; (2) limited hardware resources; (3) dynamic network structure; (4) limited transmission capacity; (5) limited energy; (6) security issues; and (7) multihop path selection [10].

In the design of smart sensor networks, the various underlying technologies should be fully considered to ensure the proper functioning of the network and the sensor network. Several major technologies are listed below [11].

2.1.1. Network Protocol. The intelligent sensor network is a new type of self-organizing network, and its network protocol design is very different from that of traditional networks. Firstly, the hardware resource limitations of the nodes themselves should be fully considered while keeping things as simple as possible; secondly, the dynamic nature of the network topology makes the data and information resources in the network change dynamically, so these issues must be taken into account in the design of the network protocol [12].

2.1.2. Time Synchronization. In order to better realize the monitoring of the target area, we must ensure that the time of each node is consistent in order to better perform relevant calculations and operations. In addition, in some smart sensor networks, the implementation of some energy saving measures also requires time synchronization with them [13].

2.1.3. Positioning Technology. In an intelligent sensor network, sometimes the tester has to be concerned not only with the information itself, but also with determining the location information of the data source. In most cases, the monitoring data obtained by the sensor nodes is closely linked to their own location information.

2.1.4. Data Fusion and Data Management. The communication bandwidth, storage capacity, processing power, and battery power of the wireless sensor network need to be considered in a uniform manner in order to meet user requirements. When monitoring the target, the collected data will inevitably produce some redundancy. If the redundant processing is not done but sent directly to the user, it will not only take up a lot of bandwidth, but also generate a lot of network traffic and cause energy consumption of the node itself, so data integration and management of these data are needed to improve the collection efficiency of the node.

2.1.5. Energy Management. As sensor nodes are often located in environments that are not suitable for power supply and in harsh environments, they are often deployed in a dense, large-scale manner in order to detect the required data more accurately. The nodes, however, rely on their own batteries to provide energy, and this arrangement inevitably causes additional problems for the nodes, so we do not use manual charging [14].

2.1.6. Security Management. In smart sensor networks, security management is mainly reflected in two aspects: information security and communication security [15].

2.2. Transmission Control Protocol TCP. TCP is a connection-oriented transport protocol. The so-called “connection-oriented” means that before two people can exchange data, they have to establish a connection, just like a telephone call, and one person has to answer and then confirm the identity of the other. Another important feature of TCP is that both sides of the connection keep track of the data transmitted and received so that there are no omissions or duplications in the data stream. TCP uses a byte-order mechanism that requires the number of bytes of data transmitted and received to be recorded at both ends of the two connections. The number of bytes is acknowledged by the receiver when a particular piece of information arrives. The senders each keep a sequence number and an acknowledgement number while keeping track of the sequence number and acknowledgement number from the other node. The sequence number indicates the position of the block of data currently in the data stream, while the acknowledgement number represents the number of data received. Typically, when the sender receives an answer, its next number is the current sequence number and answer number. This method is effective in detecting omissions and duplicates in the data stream and also facilitates the rearrangement of sequential data at the receiving end [16].

The message header of TCP can be represented by the following structure.

```

struct
{
    WORD sport, /* source port*/ dport; /* destination port*/
    LWORD seq, /* sequence number*/ ack; /* acknowledgement number*/
    BYTE hlen, /* header length*/ flags; /* flags*/
    WORD window, /* window*/ check, /* checksum*/
        urgent; /* urgent pointer*/
}TCPHEAD

```

CODE 1

The remote and destination port numbers indicate that the information belongs to the source and destination programs, so that the program does not accidentally receive information from other programs. Some ports are predefined, e.g., port 80 is for the HTTP server, port 21 is for the FTP service, and others can be customized but not specified [17].

The length of a header is the full number of bytes in a standard header plus one possible option. The label field includes some identification of handshake information such as FIN and SYN. The window size is used to limit the amount of data that can be transmitted at any one time, with the transmitter not exceeding the window limit and the receiver not exceeding the window limit. The urgent indicator provides a cross-section of data transmission for burst data transmission, as if it were a completely separate channel.

TCP provides a stable data transfer and is therefore more complex than TCP/IP, as can be seen by reading the source code of TCP/IP for the Linux operating system. As an embedded program, some simplifications can be made, for example the emergency data transfer function described above is rarely used, so this piece of code can be removed.

2.3. Web Server Webservice. The Webservice is mainly used to receive requests for HTTP (HTTP) from other terminals and to provide the required files according to the required file resources. HTTP is an application which has the port number 80. Traditional Webservers only provide a fixed page and are in fact a file server. Today, on the other hand, the web server can update the page at any time, or recreate a page, a function that is done through a Common Gateway Interface (CGI). HTTP requests to other endpoints are encoded with character messages, e.g., GET/cgi-bin/User_1?name="+ "+" . This is a typical form processing request which separates the message from the file name with a question mark, each item is separated by an &, and the blank spaces are filled in with a plus sign. The web server needs to understand and respond to the CGI functionality [18].

For the embedded system of this design, CGI is a software module built within the web server that executes programs stored on the server's hard disk. When idle, the CGI function is dormant until the web server receives a web page request, as shown above, and the web server calls the CGI function User_1().

The User_1() function can be simply programmed in C as follows.

In the above function, the entries [] array stores variable values from the text requests sent by the web server from the remote terminal. The ToWebsvr () function, on the other hand, uses the Printf () function to generate a dynamic web page, except that the Printf () function displays a variable or value on the screen, whereas the ToWebsvr function transmits the page information to the browser of the remote terminal. Thus, the following result can be viewed through the web browser of the remote terminal.

CGItestWelcome myname: zhu my address: At hust.

In this way, the web server works in such a way that the remote terminal can run a program on the server and simply send an appropriate text request for interactive access.

2.4. The Concept of International Competitiveness of Industries. Competition is the essence of the market economy, and the act of competition leads to the emergence of "competitiveness." From the perspective of competitiveness, the competitiveness of enterprises is divided into national competitiveness, industrial competitiveness, enterprise competitiveness, and product competitiveness [19].

This article takes industrial competitiveness as the object of study. Industry is a concept that lies between the state and the company. In terms of economic subjects, an industry is a collection of all enterprises with the same characteristics. From the point of view of production, industry is an act of production of products with the same characteristics. From the point of view of output, an industry is a product with the same characteristics. In terms of industry competitiveness, Porter proposed industry competitiveness, which means that industry competitiveness is the ability of a firm to hold the market and gain more benefits in competition. The international competitiveness of an industry, on the other hand, is the overall strength of an industry compared to the competitiveness of another industry, with a country as a unit. The international competitiveness of an industry is the link between a company and international competition. The improvement of an industry's competitiveness depends on the competitive capabilities of individual companies, and the improvement of these capabilities will have an impact on the competitiveness of a country. The article describes the international competitiveness of industries from the following perspectives.

- (1) The international competitiveness of an industry refers to the relative productivity of a country or a country's industry in its international market


```

int User_1 (TempEntry* entries)
{
char* name, addr;
ToWebsvr("<html>\n");
ToWebsvr("<head>\n");
ToWebsvr("<p>my address: %s</p>", addr);
ToWebsvr("</body>"); ToWebsvr("</html>");
return 0;
}

```

CODE 2

- (2) The international competitiveness of an industry refers to the comprehensive export-based competitiveness, including the import and export of products, the import of capital and labor, and the introduction and transfer of technology
- (3) The technological innovation capability of an enterprise is directly related to its international competitiveness, while the core technology of an enterprise is its core competitiveness
- (4) The international competitiveness of an industry is dynamic, and the ability of an industry to adapt to its environment becomes very important in today's world where the environment is increasingly important

3. Application Method Design

3.1. Network Interface Hardware System Structure. In the design of the network interface of a smart sensor, a comprehensive understanding of its composition is first required. As can be seen in Figure 1, the composition of a network-type smart sensor can be divided into a sensitive unit, a signal conditioning unit, a microprocessor unit, and a network interface unit. The said sensitive section converts the measured signal into the said electrical signal; the signal conditioning section realizes preprocessing such as analogue filtering, amplification, and analogue-to-digital conversion; as the core component of the smart sensor, it is tasked with acquisition, processing (digital filtering, nonlinear compensation, and self-diagnosis), data transmission, data transfer, and data local output. The data from the sensor is sent to the network in the form of a network, and the data obtained from the network is analyzed in the form of a network, so that the sensor can set and react to itself.

Sensors play a "sensory" role in the whole system, just like the five human senses, transforming all kinds of information from the outside world into information that can be accepted by the sensors. Depending on the type of sensor, sensors can be divided into physical sensors, chemical sensors, and biosensors. Physical sensors are an earlier developed and more diverse type of sensor that converts physical quantities such as force, displacement, flow, and temperature into physical quantities of electricity and light, which is achieved by using physical effects. Chemical sen-

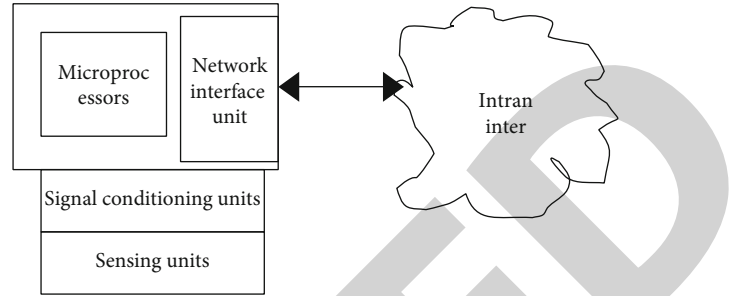


FIGURE 1: Internal structure of a networked intelligent sensor.

sors, on the other hand, are used to measure a variety of different combustible gases (CO, H₂, O₂, etc.) using chemical effects, as well as humidity sensors for determining moisture. Biosensors were originally sensors used to detect organic substances, but due to advances in bioengineering technology, its concepts are constantly being modified and updated, e.g., enzymes, proteins, and microbial cell nuclei biological tissues.

3.2. Hardware Implementation of the Network Interface.

Here, the expansion bus interface MXI can be used as a TII interface as specified in IEEE P1451.2. Therefore, the TII interface is perfectly feasible, and here we compare the MXI with the TII. Connected to the TII is a series of interface logic and signal processing circuits, here mainly concerned with analogue-to-digital conversion. The AD574A, which we mentioned earlier, converts the data received by the sensor into a digital signal by connecting to the Netbox's expansion bus interface MXI. On the Netbox, we can compare it to the NCAP as defined in IEEE P1451.1. The Netbox has a TII interface to the upper network and MXI, so it has all the hardware performance required from an NCAP point of view.

The following Figure 2 shows the connection principle of the analogue-to-digital converter. Since the MXI has only 8 data lines and the AD574A is 12 data outputs in parallel, the 12/8 pin is grounded, and the data is read twice, with XA0 being a logic 1, and the high 8 bits are read and then placed on XD0 to XD7 of the expansion bus. When XA0 is a logic 0, the lower 4 bits are read in and placed on XD4 to XD7 of the expansion bus with a 4-bit complementary zero to allow left alignment. The STS outputs an analogue/digital conversion termination signal which is inverted by a nongate followed by an interrupt signal connected to the MXI's interrupt input XIRQ7 for data reading. The start signal of the AD574A is connected to the MXI. The start signal of the AD574A is connected to the read-out signal of the MXI, both of which are low. Thus, the CPU initiates its conversion by writing the digits into the AD574A.

4. Evaluation Analysis and Policy Recommendations of Smart Sensor Networks on China's Digital Economy

4.1. Comprehensive Evaluation of International Competitiveness. Based on the classification codes of national

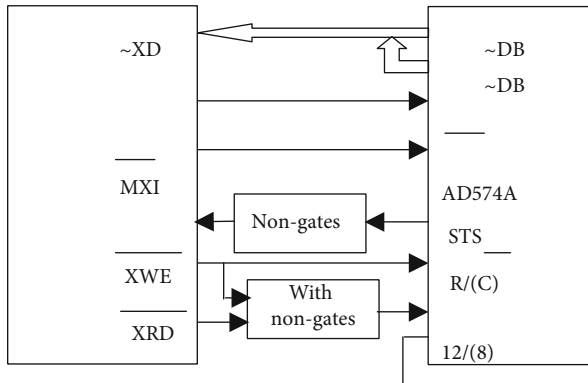


FIGURE 2: Link schematic of the AD574A.

economic industries, this paper selects Chinese medicine, computer, communication, and other electronic equipment manufacturing and instrumentation and public equipment manufacturing as research objects. On this basis, the international competitiveness of China's digital economy industry is assessed using a multifactor comprehensive assessment method.

The data for the five years of 2017, 2018, 2019, 2020, and 2021 were selected as the basis for this paper, which are collected, calculated, and summarized as shown in Table 1.

Different indicators produce very different data from unit to unit. To ensure consistency in the assessment process and fairness in the assessment results, it is necessary to dimensionalize the indicators collected. Both specification and averaging methods are commonly used in the process of factorization. As this thesis is a multiobjective assessment, the data collected is objective, and the use of normalization usually does not give a true picture of the information contained in the original data, whereas averaging maintains the variation in the individual indicators. For this reason, the averaging method was used, and the data were dimensionless normalized.

Using the averaging method in dimensionless averaging, the data for each indicator was processed using data processing software, resulting in the resulting values shown in Table 2.

The data in Table 2 are multiplied by the weight values assigned in the indicator system to obtain the evaluation results of each level of indicators.

4.2. Analysis of the Results of the Comprehensive Evaluation of International Competitiveness. In this paper, Tables 3 are summarized in Tables 1 and 2 to better understand the trends in the international competitiveness of China's smart sensor network technology industry in a macroeconomic perspective. It is clear from the charts that over the past 20-21 years, smart sensor network technology has been increasing its overall competitiveness on a global scale, showing an overall trend of growth. It can also be seen from the graph that the linear gradient value of the indicator is the largest between 1921 and 2021 of the twentieth century, which shows that the international competitiveness of our smart sensor network technology industry has grown faster during this period than in other periods. The current situa-

tion shows a high overall quality, a good adaptability, a certain resistance to external risks, and a potential for sustainable development in any international economic environment. Its comprehensive evaluation trend chart is shown in Figure 3.

4.3. Policy Recommendations for China's Intelligent Sensor Network Technology Industry

4.3.1. Optimization of the Industrial Layout of the Intelligent Sensor Technology Industry. In Chapter 3, the current industrial development situation in China is analyzed, and its industrial layout is discussed. At present, China's intelligent sensor network technology industry is centered in the east with a high degree of industrial agglomeration, while the west is lagging behind relatively. The country's economic focus has shifted to the west, and a new round of western development has led to the west being supported by a variety of national policies such as land, capital, and talent. The western region, as a postdevelopment region of intelligent sensor network technology, can directly learn from the advanced technology of the eastern region, reduce the investment risk of enterprises, reduce the investment risk of enterprises, accelerate the development of enterprises, and reduce the investment cost of enterprises.

Through empirical research, it can be seen that the current industrial scale of the domestic intelligent sensor network technology industry is not large enough, but its industrial scale is a key factor in determining its international competitiveness. The expansion of industrial scale and the formation of economies of scale can effectively enhance the overall strength of the entire industry. Therefore, it is necessary to strengthen the structure and layout of China's sensor network technology industry and to guide it effectively so as to improve its international competitiveness. In China, it is generally through the establishment of industrial parks to focus on intelligent sensor network technology industry, although the scale of industrial parks has been expanding in recent years, but in addition to the typical national high-tech zones and science and technology parks, the overall lack of integrated planning of domestic intelligent sensor network technology industrial parks and did not form a clear layout, the industrial parks in the resident enterprises vary, and some are even under the banner of intelligent sensor network technology industry under the banner of the park to enjoy the protection of national preferential policies. China should carry out scientific planning in accordance with its location and the resources it has, and take the construction and layout of high-tech parks as an important strategy so as to effectively guide the industry. It is important to achieve a reasonable gathering of resources and avoid building inefficiencies and duplication.

4.3.2. Further Improvement of Labor Productivity. From the results of empirical research, in the intelligent sensor network technology industry, labor productivity is an important indicator of its international competitiveness. Compared with developed countries, the labor productivity of the intelligent sensor network technology industry is obviously lagging

TABLE 1: International competitiveness index values of China's smart sensor network technology industry in previous years.

	2017	2018	2019	2020	2021
Gross output	27769	41996	57087	74709	105284
Value added	7213	7629	6629	14279	15172
Labor productivity	47.3	56.4	60.4	68.4	80.97
Capital productivity	1.23	1.25	1.27	1.3	1.35
International market share	11.55%	15.40%	22.56%	27.67%	25.41%
Indicative comparative advantage index	1.80	1.94	2.57	2.70	2.30
Trade competitive advantage index	0.01	0.07	0.1	0.09	0.06
Share of research staff	2.10%	2.50%	3.02%	3.70%	4.90%
Share of research funding	1.05%	1.10%	1.18%	1.30%	1.70%

TABLE 2: Results of dimensionless averaging of the values of the indicators of the international competitiveness of China's digital economy industry over the years.

	2017	2018	2019	2020	2021
Gross output	0.45	0.68	0.93	1.22	1.72
Value added	0.71	0.75	0.65	1.4	1.49
Labor productivity	0.75	0.9	0.96	1.09	1.29
Capital productivity	0.96	0.98	0.99	1.02	1.05
International market share	0.56	0.75	1.1	1.35	1.24
Indicative comparative advantage index	0.8	0.86	1.14	1.2	1.02
Trade competitive advantage index	0.15	1.06	1.52	1.36	0.91
Share of research staff	0.65	0.77	0.93	1.14	1.51
Share of research funding	0.83	0.87	0.93	1.02	1.34

TABLE 3: Level 1 indicators and comprehensive evaluation results of the international competitiveness of China's intelligent sensor network technology industry.

Tier 1 indicators	2017	2018	2019	2020	2021
Industry size	0.064	0.078	0.087	0.144	0.177
Industry productivity	0.180	0.198	0.205	0.254	0.291
Market competitiveness	0.056	0.099	0.138	0.144	0.115
Innovation capacity	0.155	0.172	0.196	0.227	0.224
Low carbonization level	-0.268	-0.170	-0.124	-0.050	0.016
Comprehensive evaluation results	0.187	0.377	0.502	0.719	0.823

behind developed countries, whose labor productivity is several times higher than ours, especially the pharmaceutical industry, whose labor productivity is almost ten times higher than ours, while the average labor productivity of the intelligent sensor network technology industry is not significantly higher than the average level of the domestic manufacturing industry, which indicates that the overall intelligent sensor network technology industry in China labor productivity is low and cannot meet the requirements of its long-term future development. Therefore, by further improving the labor productivity of the intelligent sensor network technology industry, it can effectively enhance its competitiveness in the international arena.

The ordinary way to improve labor productivity is to raise the level of technology, which is the most effective

way. Although domestic research into intelligent sensor network technology has now reached unprecedented heights, it still has some gaps in the future pace of development and in the international market. In order to enhance labor productivity, we should increase technological research and development in the field of intelligent sensor network technology, so as to enhance the competitiveness of enterprises. Secondly, it is also important to improve the overall quality of workers, and from the national point of view, we should pay more attention to education and carry out reforms for cultivating more outstanding talents. Intelligent sensor network technology is an emerging industry, and it is difficult to adapt to the overall characteristics and development trend of the intelligent sensor network technology industry if the existing management style is not adjusted in

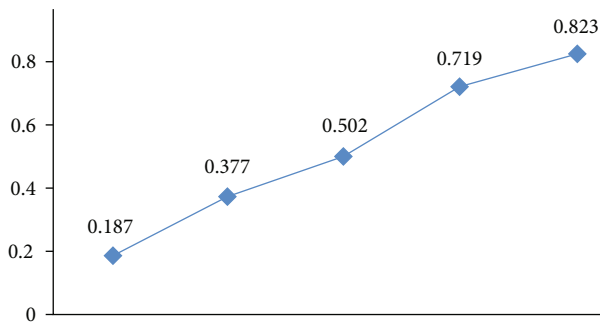


FIGURE 3: Trend chart of comprehensive evaluation results.

a timely manner, relying only on the traditional management style.

With the continuous development of the national system, the further development of the intelligent sensor network technology industry will also become better and better. After the reform and opening up, we have continued to innovate the system and have made great achievements. The development of any era and any industry cannot be separated from a country's system and system, which is the key to solving this problem, and must be changed through the system so that the level of technology can be improved and the overall quality of the workers can be improved, which will lead to changes in the way enterprises operate. Therefore, we should grasp the development trend of intelligent sensor network technology in general and make bold adjustments to our current economic system to adapt to the development of intelligent sensor network technology industry, so as to promote the development of the economy.

5. Conclusion

With the rapid development of the electricity market, the digital economy is also gaining more and more attention from industry, and WSN, as an emerging technology, is increasingly favored by major companies and research institutions.

The analysis of the international competitiveness of China's digital economy industry from a macroperspective is a topic of great practical importance. However, due to the limitations of my academic knowledge and experience, this article still has many flaws. Due to the limitation of information, this article only analyzes the carbonization level of advanced foreign countries and does not estimate the CO₂ emissions in their development process. Secondly, due to the lack of clarity of country-specific policies, the relevant policies are not included in a systematic indicator. This subject, therefore, is still open to further research in the future.

Data Availability

The dataset used in this paper are available from the corresponding author upon request.

Conflicts of Interest

The author declares that they have no conflicts of interest regarding this work.

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