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Research on the Development Status of Smart and Healthy Pension Industry in Chongqing for 2035 based on TF-IDF Algorithm

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Abstract: The problem of population aging is crucial to social development, and the development of smart health care industry is one of the solutions to the problem of population aging. At present, the smart healthy aging industry in Chongqing is still dominated by governmental departments, and policies have a guiding role in the development of the industry, so policies are highly researchable. This paper collects 42 policy texts from March 2016-2023, extracts the keywords in the policy library using the TF-IDF algorithm, analyzes the development status and problems of the smart old-age health industry in Chongqing Municipality in the context of the actual situation, and puts forward relevant suggestions for the future development of the smart old-age health industry in Chongqing Municipality.

Keywords: Smart Aging; Aging Policy; TF-IDF Algorithm.

1. Introduction

Since the 21st century, the global trend of population aging has become increasingly severe, and the degree of aging has developed in a deeper and more severe direction, which has also become an important issue that cannot be avoided in the development of Chinese society. The trend of population aging in China is characterized by large scale, rapid speed, high ageing, aging before getting rich, and large old-age dependency ratio [1]. However, with the development of the Internet, the new pension model of smart pension has been proposed by the Life Trust of the United Kingdom. Zhu Y defines the smart health pension industry as an industry that utilizes intelligent information technology such as the Internet, the Internet of Things, and big data to enable the elderly to enjoy intelligent, informative, and modernized pension services and products[2].Liu and other scholars believe that the traditional pension industry can no longer meet the needs of society, and that the smart pension health industry is an inevitable trend of social development, combining the traditional pension industry with the Internet, big data and other modern information technology, which is more adaptable to the development of society and will subvert the traditional pension industry [3-6].Li proposes a new model that combines the use of Internet of Things, cloud computing and other technologies with the traditional pension industry [7].Jia proposes that it should be relying on the background of the construction of the smart city, to build a new big data-driven pension model [8].Tong proposed a new model combining blockchain and smart pension [9]. However, Liao and other scholars believe that China's smart old-age industry is currently characterized by insufficient supply and structural contradiction between supply and demand, which leads to the urgency of supply-side structural reform of the smart health and old-age industry and points out that China's smart old-age industry exists in the form of insufficient top-level design and weak concept of smart old-age and other problems [10-12].

Based on the existing research, this paper utilizes the TF-IDF algorithm to analyze the policies related to the intelligent healthy aging industry in Chongqing Municipality, China, and analyzes the problems of the intelligent healthy aging industry in Chongqing Municipality, as well as puts forward some suggestions on how to develop intelligent aging and health industry in Chongqing Municipality in the future.

2. The Basic Fundamental of TF-IDF

2.1. TF-IDF Algorithm

Policy texts usually play a leading and guiding role for the industry sector, and can reflect the current situation and shortcomings of the development of that industry. /, but it is still difficult to extract effective information from the huge amount of policy texts. And keywords, as words that can reflect the topic or content of policy texts, play an indispensable role in extracting effective information. In the field of NLP, TF-IDF algorithm is an algorithm for extracting keywords of massive information in natural language processing. the main idea of TF-IDF algorithm is firstly, the importance of a keyword is proportional to the number of times it appears in a document, and secondly, its importance is inversely proportional to the frequency it appears in the corpus. the larger the value of TF-IDF, the more important the word is in the corpus, and vice versa, the less important it is. That is, TF-IDF consists of two basic elements:

(1) word frequency: the frequency of words in a document, if a word appears in the document, the higher the frequency, the more expressive the word is to the document, that is, the more able to summarize the subject of the document. The formula is shown in (1).

$$\mathrm{tf}_{i,j} = \frac{n_{i,j}}{\sum_k n_{k,j}} \tag{1}$$

(2) Inverse document frequency: the frequency of words in

the corpus, if a word appears more frequently in the corpus, it means that the word has no distinguishing power in the corpus, i.e., it does not summarize the subject of the document.

$$idf_i = \log \frac{|D|}{|\{j : t_i \in d_j\}| + 1} \quad (2)$$

Combining the two factors of word frequency and inverse document frequency to weigh the importance of words in the documents and the corpus, the TF-IDF algorithm is calculated as shown in (3).

$$tf_{i,j} \times idf_i = \frac{n_{i,j}}{\sum_k n_{k,j}} \times \log \frac{|D|}{|\{j : t_i \in d_j\}| + 1} \quad (3)$$

2.2. Improvement of TF-IDF Algorithm

Since the TF-IDF algorithm is more inclined to filter words after common words and tone words and keep relatively critical words, it actually only considers the frequency of words appearing in the document and the number of times they appear in the corpus, which has a lower utilization of the text content. Therefore, we made restrictions on the lexicality of words when analyzing the policy text, and only retained noun words containing more critical information, for which the TF-IDF values were calculated.

3. Results

3.1. TF-IDF Modeling

The TF-IDF model of Chongqing's intelligent health care industry policy text is implemented using Python.

3.2. Comprehensive Analysis of Policy Texts

At the end of 2016, the release of Several Opinions of the General Office of the State Council on Comprehensively Liberalizing the Pension Service Market and Enhancing the Quality of Pension Services marked the beginning of the relevant planning and layout of the smart health care industry at the national level, and the Chongqing Municipal Government started to follow up in the same year.

In this paper, we utilize Python crawler technology to collect data on the relevant policies of Chongqing Municipality from 2016 to March 2023, and a total of 42 policy texts were collected. Then using a combination of quantitative and qualitative methods, the number of texts, types of texts, and departments of texts issued in Chongqing Municipality were statistically described. Subsequently, the keyword extraction algorithm TF-IDF algorithm was utilized to extract keywords from the collected policies, and the policies were dissected and interpreted from the perspective of keywords.

In terms of the number of documents issued, the Chongqing Municipal Bureau of Civil Affairs issued the Notice of the General Office of the Chongqing Municipal People's Government on the Issuance of the 13th Five-Year Plan for the Development of Chongqing Municipal Civil Affairs in 2016, which was the first time that concepts related to the smart health and elderly care industry were raised in Chongqing municipal government documents. Since then, Chongqing's related policies have been gradually improved. As can be seen in Figure 1, in the past seven years (2016-2022), the release of policies related to the smart health care industry in Chongqing Municipality was mainly concentrated in 2020 and 2021, accounting for 52.38% of the total number of policy texts. Among them, 2021, as the opening year of the "14th Five-Year Plan", is also the most frequent year for the release of related policies, with the number of policies released that year exceeding the total number of policies in 2016-2019.

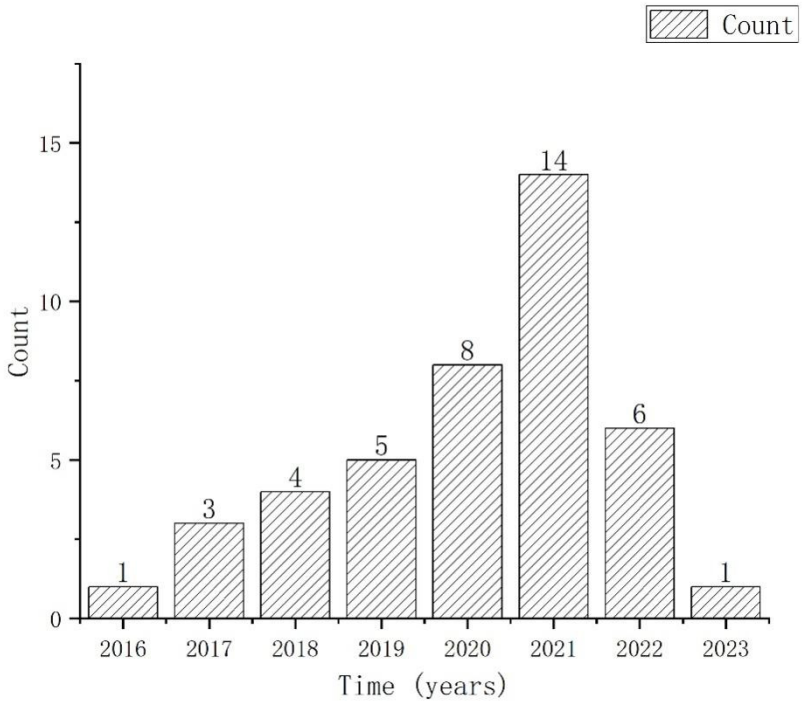


Fig 1. Time chart of policies related to Chongqing's smart health care industry

In terms of the type of issuance, the 42 policy texts collected in this study cover a wide range of text types such as notices, opinions and announcements. As shown in Table 1, notices account for the highest proportion of policy texts,

reaching 76.19%. Notification texts are administrative norms, which are both authoritative and not formal laws, highlighting the administrative guidance. This indicates that, because the smart healthy aging industry is affected by the emerging nature as well as uncertainty, Chongqing Municipality is still mainly guided by governmental departments to carry out top-level design and macroscopic layout for the development of the smart healthy aging industry in Chongqing Municipality.

Table 1. Chongqing Smart Healthy Aging Industry Policy Type Release Statistics

Category	Announcement	Suggestion	Notification	Opinion
Count	3	1	32	4

From the perspective of the issuing body, the issuing body of Chongqing Municipal Smart Healthy Aging Industry includes a number of departments such as CPC Chongqing Municipal Committee, Chongqing Municipal People's Government, Chongqing Municipal Bureau of Civil Affairs, Chongqing Municipal Bureau of Finance, Chongqing Municipal Economy and Informatization Committee, Chongqing Municipal Health Committee, Chongqing Municipal Culture and Tourism Development Committee, and Chongqing Municipal Housing and Urban-Rural Development Committee, and so on. As can be seen in Figure 2: First, it is difficult to develop the intelligent healthy aging industry, and all municipal departments have issued relevant policies on this; second, among them, the Chongqing Municipal People's Government has issued 22 documents as the main issuing department, which highlights that Chongqing Municipality has a high level of design and strong effectiveness of the policy, which has an important guiding and leading role in the design of policies for the rest of the municipal departments; third, the Chongqing Municipal Bureau of Civil Affairs has played an important role as the intelligent Healthy Aging Policy in Chongqing's specific implementation department, a total of 11 relevant policy texts were issued in 2016-2023, highlighting the fact that Chongqing Civil Affairs Bureau, under the guidance of the CPC Central Committee, the State Council and the Chongqing Municipal Government, has been actively searching for solutions to pave the way for the layout of the future development of the Smart Healthy Aging Industry in Chongqing Municipality.

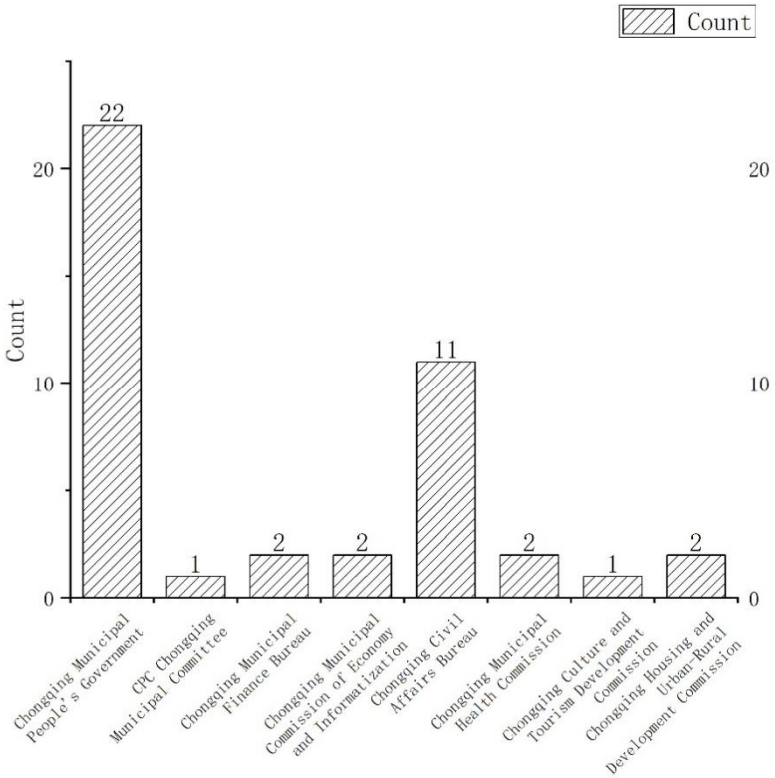


Fig 2. Number of policies issued by the main issuing departments of Chongqing Smart Healthy Aging Industry Policies

3.3. Analysis of Experimental Results

Table 2. Core words of Chongqing's intelligent health care industry policy (part)

Home Affairs	Technology	Rural	Beds	In-Home
Quality of services	homes for the elderly	elderly care	services	health care
Care	Elderly	Intelligence	Internet	Aging
Nursing homes	informatization	intelligence	recreation	……

By calculating the TF-IDF values of 42 policy texts on smart health and elderly care industry in Chongqing from 2016 to March 2023 and sorting them from highest to lowest, the following keywords were derived, as shown in Table 1.

From the comparison between the calculation results and the actual situation, the keywords extracted by this TF-IDF model are more accurate and can reflect the current situation of the development of smart elderly health industry in Chongqing.

Combining the experimental results with the analysis of the actual situation, it is concluded that the current policy core of Chongqing city: firstly, the government departments take the lead in using the Internet technology to improve the service environment of the traditional elderly service industry with the elderly homes and nursing homes as the core, and enhance

the quality of elderly service; secondly, the government departments fund to strengthen the construction of infrastructure, increase the construction of rural elderly facilities, and provide the elderly for the increasingly high aging Third, the government departments combine the current development status, combine the intelligent elderly health industry with the big health industry, and promote the new model of aging at home, community aging, and the combination of recreation and health, so as to provide a more comfortable and convenient aging environment for the elderly.

3.4. Recommendation

From the experimental results and the actual situation, the current intelligent healthy elderly industry in Chongqing is still facing related dilemmas:

(1) The market structure is single, and the diversified needs of the elderly are difficult to be met. At present, the business operation mode of the intelligent healthy elderly industry is still government-led, and the investment enthusiasm of private enterprises has faded, and the service diversity is low.

(2) The lack of professional talents makes it difficult for service quality to reach a new level. As a new industry, there are fewer talents in the new senior care service industry, and the professional quality of traditional senior care service personnel is low, so they cannot adapt to the new senior care service mode, and it is difficult to improve the quality of senior care service.

(3) The degree of wisdom of old-age care is low and information sharing is difficult to realize. Since there is no unified data platform between departments at all levels, it is difficult to share relevant data, resulting in the wisdom of the elderly cannot give full play to its role.

In response to these three problems, the following recommendations are made in conjunction with field research, etc.:

(1) Open elderly market plan: Construct an all-way internal and external linkage framework. First, establish and improve the list of basic services of community elderly service facilities, and give full play to the functions of community elderly service facilities. For example, support senior care service organizations to carry out community day care services to provide rehabilitation assistance, care and nursing, and cultural and recreational services for the elderly in need. Second, social forces should be guided to provide diversified elderly care services to the middle and low-income groups in society. In addition, services should also be provided to the middle- and high-income groups in an appropriate manner to meet the multi-level needs of the elderly. Thirdly, vigorously develop senior care service enterprises, encourage the chain operation and group development of enterprises, cultivate leading enterprises with standardized management and various characteristics, and support the diversified development of small and medium-sized enterprises. In this way, leading enterprises and small and medium-sized enterprises can develop together and gradually form a senior care service industry cluster. Fourthly, improve the city's smart senior care platform and promote the socialization and marketization of using openable senior care service data. In addition, it should also promote the sharing of senior care service data resources and support enterprises and institutions to use mobile cloud computing, big data, Internet, Internet of things and other technical means to deeply integrate with senior care services, so that home wisdom senior care services can be innovated.

(2) Standardization of industry standard plan: construction of an integrated platform for information sharing. On the one hand, we should strengthen the construction of informationization of senior care services. We should make full use of national policy guidance to actively promote the development of information construction of senior care services and adopt a win-win cooperation approach to promote the common development of the whole industry. Such an initiative will help realize the construction of a bottom-up, inclusive and diversified senior care service system to meet the growing multi-level and high-quality demand for healthy senior care for the elderly and enhance their sense of access, happiness and security. On the other hand, there is a need to improve the relevant technology level. However, the release of the policy has to a certain extent promoted the development of the intelligent elderly service industry, but since it is a new industry, there are still problems such as insufficient technology, insufficient integration and weak public service capacity of the products. The development system of the wisdom health elderly industry still needs to be improved, and a closed chain needs to be formed, similar to the current e-commerce industry - there are certain procedures from production to getting it into the hands of customers, forming its own set of system to continuously optimize and improve the industrial ecology of wisdom elderly services. Overall, the construction of an information sharing all-in-one platform relies most on Internet technology and the data collection of different industries by big data, and timely breaking of information barriers can greatly promote the further development of the intelligent senior care service industry.

(3) Industry talent cultivation plan: create a ladder talent cultivation pattern. First, we should strengthen school-enterprise cooperation, promote the integration of industry and education, and create a high-quality and high-quality talent training model. Through school-enterprise collaboration to jointly cultivate high-quality talents for senior care services, and play the advantage of educational resources and expert talent resources of institutions to promote the active play of the cooperation and exchange and resource sharing platform of the wisdom and health senior care industry. Secondly, we should, establish and improve the reward policy for senior caregivers, encourage and support the growth of senior caregivers, organize senior caregiver skills competitions and professional skills training regularly, and create room for the growth of senior care service practitioners who make senior care work to the next level.

4. Conclusion

At present, Chongqing's smart health and elderly care industry is in the preliminary development stage, but the framework of relevant policy system of Chongqing government departments has been in a certain scale. In this paper, by analyzing the policy texts using TF-IDF algorithm, the following conclusions can be drawn:

(1) With the increasing seriousness of aging, aging as an important issue in China's socialist modernization, there is much attention on how to build a smart healthy elderly industry system. Chongqing government departments have responded positively to the spirit of relevant national documents, put forward guiding opinions and planning suggestions for Chongqing's smart elderly health industry according to local conditions, and made top-level design and macro layout for its development, and achieved certain results.

(2) In recent years, the relevant policies in Chongqing mainly focus on improving the traditional elderly care model and proposing new elderly care model. Among them, the improvement of traditional elderly care model is mainly based on the construction of elderly care infrastructure, the use of new technologies to improve the quality of elderly care services, and the vigorous promotion of the combination of large health industry and intelligent health and elderly care industry to empower the traditional elderly care industry; the new elderly care model is mainly based on the recommendations of relevant national documents such as community elderly care, home elderly care, and the creation of 15-minute elderly care circle, and the development of new elderly care model according to local conditions.

(3) At present, Chongqing's intelligent healthy senior care industry still needs further development, and the problems of market service diversity, sharing and security of relevant data and information, and talent training still need to be further solved.

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