Research on The Sustainable Development Matrix of Home-Based Elderly Care Services in Free Trade Ports from The Perspective of Artificial Intelligence

Huan Zhou, Guoqiang Zeng, Ziyi Ren, Xuemin Han, Jianrong Tang*

Hainan University, School of Applied Science and Technology, 570228, Haikou, China

*Corresponding author: tjrhunan@hainanu.edu.cn

Abstract. With the development of the economy and the improvement of living standards, the new model of home-based elderly care services has gradually been developed and achieved certain results, but there are many difficulties in the process of exploration. Although the government departments have provided many preferential policies, there are still problems such as small number of service groups, scattered service objects and high operating costs. In order to achieve sustainable development of home-based elderly care services, further problems need to be solved. In response to this problem, this study combines the perspective of artificial intelligence and uses information technology to establish a sustainable development matrix of home-based elderly care services to realize intelligent home-based elderly care services in free trade ports.

Keywords: home care services; sustainable development; artificial intelligence perspective; matrix

1   Introduction

As far as family care is concerned, the advantage is that care in a family is most in line with the traditional Chinese cultural characteristics of introversion. The deep-rooted family circumstances of the Chinese determine that the family must be the first choice for the care of the elderly [1]. Family pension is the best transmission of blood kinship. It can not only carry forward the "filial piety" culture of Chinese civilization for thousands of years, but also reduce the burden on the government and society to a large extent. Due to social transformation and economic transition, especially changes in population structure and family miniaturization, the disadvantages of family pensions are gradually exposed [2]. The younger generation, who are responsible for family care for the aged, devote more energy to work and study, and pay more attention to their own quality of life due to the increasing pressure from social and economic aspects, and physical and mental release, and there is not much time for supporting the elderly [3-4]. With the increase of the elderly population, the problems of the elderly are also increasing, and the quality of the elderly care needs are becoming more and more

complex [5-6]. Therefore, people will naturally think about whether they can seek help and support from the outside world for more specialized elderly care services [7].

"Smart old-age care" is to use information technology combined with modern science and technology to develop a smart old-age care system and information platform for the elderly at home, communities and old-age care enterprises, based on the needs of the elderly and the application of artificial intelligence technology [8-9]. Realize the interconnection of all things and intelligent elderly care services. In the process of actively coping with the aging of the population, smart old-age care fully provides guarantee for the life of the elderly and improves the quality of old-age care services. China's "14th Five-Year Plan" proposes to improve the basic elderly care service system and develop inclusive elderly care services, which has become a new direction to promote the coordinated development of elderly care and industry. With the development of a new round of information technology, the intelligentization of the elderly care industry has ushered in opportunities and challenges. "Intelligence" has become a new opportunity for the development of China's elderly care industry, and the smart elderly care industry has become the main starting point to drive the development of the silver economy[10-12].

2   Establishment of a matrix model for the sustainable development of intelligent elderly care services

Qualitative evaluation is the process of evaluating the occurrence of a certain situation based on the experience and knowledge of relevant experts. Qualitative evaluation has a certain degree of subjectivity. As a whole, it is based on the fact that the evaluator conducts on-the-spot inspections according to the actual situation of the object being evaluated. Comments related to the object being evaluated. If there are multiple objects to be evaluated, it is necessary to establish a unified standard for the evaluation process or invite the same experts to evaluate different objects. In the process of qualitative evaluation of elderly care services, more attention is paid to the ability of observation, analysis and induction.

Quantitative risk assessment is to obtain a risk assessment index system through the collection of historical risk data, or through the sorting of relevant laws and regulations, and to carry out objective and reasonable quantitative calculation of the risk status of different fields from multiple dimensions. The quantitative assessment indicators can be Data that clarifies numerical information can also be converted to data that can represent numerical information through metadata description.

Table 1. Analysis of methods

Evaluation method	Method description	Advantage
Utility coefficient	Quantify risk indicators and convert them into quantitative values that measure risk assessment issues	The evaluation process is simple and easy to implement, providing a basis for determining the risk assessment level

DEA	Mainly in the effective evaluation of multi-input, especially multi-output decision-making units of the same type	Achieving comparability in the research process
Mutation series evaluation	Decomposition of multi-level contradictions of evaluation targets, combining catastrophe theory and fuzzy mathematics	Considering the relative importance of each evaluation index, it reduces subjectivity without losing scientificity
Coefficient of variation method	Risk assessment method to measure the degree of variability of observations in data or indicators	Easy to understand, simple to operate, objective and scientific in operation results

The coefficient of variation method is an objective weighting method that obtains the value of the coefficient of variation by calculating the standard deviation of the data. The specific calculation steps are as follows:

Step1: Build a risk evaluation index matrix, let M represent the object to be studied, and let N represent the content of the index to be evaluated, then the matrix feature is $P=(x_{ij})_{M \times N}$, $(i=1, 2, ..., j =1, 2, ..., M)$

Step2: Calculate the eigenvalues of specific indicators, mainly to calculate the standard deviation of each indicator. The calculation formula is as follows:

$$\sigma_k = \sqrt{\frac{\sum(x_k - \bar{x}_k)}{n-1}} \tag{1}$$

In the formula, is the standard deviation of the k-th index, and is the average of the k-th index.

Step3: Calculate the coefficient of variation value of specific indicators. Using the results obtained by the standard deviation calculation, the coefficient of variation value of each index was calculated. The calculation formula is as follows:

$$V_k = \frac{\sigma_k}{\bar{x}_k} (k = 1, 2, ..., n) \tag{2}$$

V_k is the coefficient of variation of the k-th index, σ_k is the standard deviation of the k index, and is the average of the k index.

Step4: Calculate the weight of each index, and normalize the value of the coefficient of variation according to the calculation result of the coefficient of variation. The formula for calculating the weight of the k indicator is shown in (3):

$$W_k = \frac{V_k}{\sum_{k=1}^{n} V} \tag{3}$$

W_k is the weight of the k index, and V_k is the coefficient of variation of the k index.

3   Experiment analysis

Select 10 users to analyze the satisfaction of elderly care services from the perspective of artificial intelligence. The statistical results are shown in Table 2.

Table 2. Satisfaction Analysis

User	satisfaction
1	0.77
2	0.82
3	0.79
4	0.80
5	0.71
6	0.73
7	0.81
8	0.83
9	0.80
10	0.79

Through the analysis of satisfaction, it can be found that the average satisfaction is above 75%, and artificial intelligence technology can be effectively used in elderly care services.

4   Analysis of existing problems

(1) The aging trend is accelerating, and the difference between urban and rural areas is becoming more and more obvious. The proportion of the elderly population has gradually increased, and all aspects of our society have presented a grim situation. In addition to economic and social reasons, the urban-rural disparity in the level of aging is gradually increasing. It is also closely related to population mobility. Rural land resources are abundant but the utilization rate is low, resulting in serious waste of land resources. The rural population base is large, and the quality of the rural youth population is gradually improving. Most people bid farewell to their hometowns and go to large cities to study, study, work, live and settle down. The growth of the demographic dividend has led to the slow development of the rural economy, and the difference between urban and rural areas has become more and more obvious.

(2) For the elderly, the creators of social wealth in the past are now ushering in the golden autumn season of life. When you were young, you frugally used your savings, government pension subsidies, and child support for the elderly. Apart from a small part of the basic normal consumption expenses of old age, out of concerns about the medical insurance system, children were raised across generations. The increase in costs and expenses has led the elderly to dare not increase additional consumption expenditures, which is a common mentality among the elderly.

(3) Under the background of today's aging society, the serious shortage of nursing staff has become a stumbling block for the construction of intelligent elderly service talents. Due to the long working hours and high labor intensity of nursing staff, there is a shortage of professional service personnel in nursing institutions. And because the salary of nursing staff is generally low, and the influence of stereotypes is deeply rooted, there are misunderstandings and prejudices about the work of nursing staff in the society. However, the problem that cannot be ignored is the low professional quality of elderly care practitioners, which leads to the phenomenon that the overall level of such service personnel is particularly low. Driven by the development of the new smart elderly care model, the level of elderly care services is uneven. Smart elderly care platform services rely on big data and artificial intelligence to provide smart and precise services for the elderly. Various companies have developed many information platforms for smart elderly care services for the purpose of making profits. Due to the different needs of community elderly care institutions, the competition between platforms is high and the connection is not strong, so the interconnection and interoperability of smart platforms cannot be realized, and problems that arise cannot be solved in a timely manner. Although the information technology brings convenience, the specialized production team has a small number of researches, and the products are relatively inferior. They attach importance to marketing but ignore the level of after-sales service. As the age increases, the acceptance of new smart products gradually decreases. The developers of some artificial intelligence products did not design products according to the actual needs and living habits of the elderly. Some product design pages are complicated and cumbersome, and the elderly cannot complete the desired interface according to the guidelines, which has great limitations.

(4) Under the three operating modes of home care, community care and institutional care, the safety supervision system to ensure the personal safety and fire safety of the elderly after an abnormal event is incomplete. There are still loopholes in the evaluation service system for psychological factors such as daily care and spiritual comfort for the elderly. At the same time as the development of new-generation information technologies such as artificial intelligence, the degree of systematization in the provision of business, data, supervision and services by the main stakeholders of elderly care products is relatively low. It is difficult to solve the problem of how to standardize the basic information and business information of each elderly person, and it is even impossible to utilize, store and collect the data generated by the elderly in real time.

Therefore, the risk assessment model constructed in this study is of great significance for judging the effect of intelligent old-age care.

5   Proposal of countermeasures

Compared with the traditional pension model, "Internet +" smart pension can not only alleviate the conflicts with children, but also give the elderly the right to accept new products. With the continuous development of the old-age care system, people's consciousness of old-age care is gradually improving. How to achieve peace of mind and

comfort, and eliminate pain points and difficulties will become the development direction of creating a new smart old-age care model.

In the field of big data technology, the intelligent nutrition catering system stands out. It provides personalized and humanized intelligent catering services for the elderly by collecting the age, dietary preferences, food taboos and physical condition evaluation results of the elderly for data analysis., form a series of recipes and health management reports, and specify a nutritional plan for each elderly person's physical condition. The intelligent nutritional catering system can reduce the cost of purchasing food, improve economic benefits, and help the elderly to "eat" and have fun. On the premise of ensuring the health of the elderly, provide the elderly with a diet that is more conducive to preventing and resisting diseases, and escort the body of the elderly from a professional perspective. Through the intelligent security early warning system, the life safety of the elderly can be dynamically monitored, and the data in the surveillance cameras can be analyzed in real time by the intelligent video surveillance equipment. There is no need to re-install the original surveillance system and equipment, and the utilization rate of the renovation of the old things is greatly improved. Adopt the method of technical marketing to provide consumers with integrated services such as products, services and technologies, effectively integrate resources, and adopt differentiated marketing strategies to reduce production costs and increase the scope of the target market area.

6   Conclusion

The "14th Five-Year Plan" period is a historical convergence period for the realization of the "two centenary goals". It is also a critical period for the basic realization of socialist modernization after building a moderately prosperous society in an all-round way. It is also an important strategy for actively responding to my country's population aging. period of opportunity. Under the dilemma of my country's serious aging population, narrow the economic gap between urban and rural areas, increase the construction of intelligent elderly care service talents, and improve the supporting elderly care system and population service system, so as to help the three types of elderly care ecological operation modes of home, community and elderly care institutions. Mutual coordination provides guarantee. Under the continuous development of artificial intelligence, with the help of the comprehensive information service platform for "elderly care" and "health", the operators, individuals, families, connecting communities and institutions, using digital and informatization means to improve data utilization and maturity, to meet the diverse, multi-level and high-standard needs of the elderly. Nowadays, smart technology empowers the development of the smart old-age care model from the aspects of life care, physical health, personal safety, and psychological counseling. How to accurately market technology products in the new smart old-age care model depends on the characteristics of each stage of the product life cycle. Implementing different market strategies has become an important factor in corporate profitability.

References

1. Xu Zhenxing, Zhang Mingming. In-depth application of artificial intelligence in smart elderly care [J]. China Security, 2022(08):69-72.
2. Wang Maoran. Research on the development of smart old-age care model from the perspective of artificial intelligence [J]. Business Culture, 2022(17):100-101.
3. Zhang Min, Zhang Na. The legal dilemma and improvement path of smart old-age care [J]. Journal of Yuncheng University, 2022, 40(02): 53-60. DOI: 10.15967/j.cnki.cn14-1316/g4. 2022.02.004.
4. Ma Jinlai. Artificial intelligence spawns smart elderly care services [J]. Family Science and Technology, 2022(02):47-48.
5. Zhao Yan. The ethical dimension of intelligent elderly care [J]. Journal of Shanghai Jiaotong University (Philosophy and Social Sciences Edition), 2022, 30(01): 63-70. DOI: 10.13806/j.cnki.issn1008-7095.2022 .01.007.
6. Zhao Jilun, Zheng Yao. Ethical risks and countermeasures of intelligent elderly care [J]. Welfare Research, 2021, 4(00): 71-78.
7. Zhao Nan, Liu Shuangling, Sun Xiangna. Application of artificial intelligence in home care and ethical thinking [J]. Chinese Medical Ethics, 2021, 34(12): 1590-1594.
8. Wang Zhanghua, He Wenyuan. The ethical risk of smart old age care and its resolution [J]. Journal of Tianjin Administration Institute, 2021, 23(06): 45-54. DOI: 10.16326/j.cnki.1008-7168.2021.06.005.
9. He Ni, Huo Congcong, Xu Gongcheng, Ping Haozheng, Zhang Tengyu, Li Zengyong. The impact of artificial intelligence applications on the quality of elderly care services: an empirical analysis based on surveys in Hangzhou, Hefei and Wuhan [J]. Social Security Research, 2021 (05):72-80.
10. Li Yang. An Analysis of Legal Issues Related to Smart Elderly Care [J]. Legal Expo, 2021(30):17-19.
11. Zheng Yao. Research on the ethical risks and coping strategies of intelligent elderly care [D]. Northeast Normal University, 2021.
12. Zheng Haiyan, Ran Xingcheng, Xu Shenggang, Yang Lifeng, Wang Xiaoyan. Application of artificial intelligence technology in elderly care [J]. Integrated Circuit Application, 2021, 38(09): 184-185. DOI: 10.19339/j.issn.1674- 2583.2021.09.090.