

SWOT Analysis of Wenzhou Intelligent Elderly Care Market in the Age of Artificial Intelligence

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Abstract

Wenzhou, which is at the forefront of China's private economy, has been deeply involved in the field of intelligent recreation and care in recent years, and aims to complete the upgrading of elderly care services with the help of digital technology. As the aging trend intensifies and the double pressure of uneven distribution of urban and rural resources intertwines, Wenzhou's intelligent recreation and care construction faces many practical challenges. Against the back-drop of the artificial intelligence era and using SWOT analysis, this study aims to thoroughly analyse the potential opportunities and prominent dilemmas in the development of intelligent elderly care in Wenzhou, reveal its core contradictions, and provide clues for solving this problem and planning future strategies.

Keywords

Artificial Intelligence; Elderly; SWOT

1. Introduction

In the context of the era of the deep integration of artificial intelligence and digital economy, Wenzhou City, intelligent pension market relying on Zhejiang Province, 'Zheli Kangnang' digital platform, intelligent wearable devices, Internet of Things technology and other digital tools, built a multi-scene intelligent pension service system covering home care, community care and institutional care, formed a policy guidance as the driving force, supported by technological innovation, innovation in service mode as the core, featuring the collaborative development of industry chain ecosystem. It has formed an ecological system of smart old-age care driven by policy guidance, supported by technological innovation, and centred on service model innovation, featuring collaborative development of the industrial chain. From the perspective of the development status, Wenzhou City, the wisdom of the elderly market presents a continued increase in policy support (such as 'Wenzhou City, the development of senior care services,' '14th Five-Year Plan' and other documents issued), VR technology, wearable devices, AI and other emerging technologies to ac-

celerate the application of home community institutions, the depth of the integration of senior care services, healthcare, recreation and nourishment industry synergistic development of notable features, but in the rapid development of the same time, also faced with the intelligent terminal suitable for the elderly, the elderly digital divide. Insufficient aging transformation, prominent digital divide problem of the elderly, unsound health data privacy protection mechanism, shortage of smart elderly professional nursing talents and other real challenges. Therefore, this paper applies SWOT analysis to systematically analyse the internal advantages and disadvantages, as well as external opportunities and threats of Wenzhou's intelligent aged-care market in terms of policy environment, technological foundation, and market demand, with the aim of providing theoretical basis and practical reference for the optimization of the regional intelligent aged-care service system.

2. SWOT Analysis of Wenzhou Intelligent Elderly Care Market

2.1. Strengths

2.1.1. Policy foresight and pilot experience

Wenzhou, as the first city in the country to establish a key linkage to elderly health, has benefited from strong policy support. For example, the promulgation of the Regulations on the Promotion of Home Care Services in Wenzhou City set clear goals for the construction of a home care service system and facilitated the digital transformation of 'Zheli Recreation and Nursing', shaping the health environment of the 'community of the future'. Given Wenzhou's early entry into the ageing society in Zhejiang Province, the city has built a smart elderly care model centred on government guidance, state-owned enterprise guarantee and market operation. Specific examples include the government's inclusion of home safety and security for the elderly in its livelihood projects for three consecutive years, and the retrofitting of more than 5,000 households in difficulty. Meanwhile, Wenzhou Telecom worked with the government to create the world's first immersive recreation and nursing experience centre and explored standardised solutions for elderly services. Through government-purchased services, Wenzhou has equipped elderly households with safety equipment such as smart water flow monitors, millimetre wave radar and smart smoke sensors, and introduced state-owned enterprises such as Telecom and CGC to jointly build a home safety and protection system for the elderly. Relying on ZhongGuang (Wenzhou) Cable Information Network Co., Ltd, a home safety guarding platform for the elderly in Wenzhou City has been established, and the digital emergency rescue mechanism has been continuously optimised. These actions highlight the Wenzhou Municipal Government's strong commitment and remarkable support in the field of intelligent recreation.

2.1.2. Active business participation and more mature market-based operations

In order to enhance the level of home safety and security for the elderly, Wenzhou City has actively adopted the market-based operation mode and encouraged the participation of multiple social forces. Wenzhou Modern Group and Greentown Recreation co-development of modern Jinzhujiayuan project, for example, the project's total investment of 867 million yuan, aimed at building a set of 'medical, recreation, nourishment, care, education' in one of the recreation complex, the service content covers the life of living, recreation and learning, health care and other dimensions. In addition, Wenzhou City has also set up an offline experience centre, launched, including magnifying mirror nail clippers, presbyopia, massage chairs, smart beds and other aging products and services, to provide product sales, leasing and aging transformation and other diversified services.

Wenzhou City also relies on state-owned enterprises to build a 'smart security guardian platform'. The platform integrates massive Internet of Things data, and based on equipment application scenarios and warning levels, the implementation of 'three-level deployment, six-level response' mechanism. The platform adopts 'green, yellow, red' three-level warning system, through the 'equipment monitoring - anomaly feedback - real-time warning - emergency call - inspection feedback Artificial return visit' six-level response process, build a perfect home security protection system. Meanwhile, the number of registered users of Wenzhou 'Happy Nursing Supermarket' platform has grown to 131,200, of which 81,100 are social users, and the platform co-ordinates 60 pension services in 9 categories, such as housekeeping and cleaning, rehabilitation and nursing care, and assisted meal services. Through the implementation of the 'children online ordering - the elderly offline experience' service mode, the platform in 2024 the number of registered users reached 131,200 people, the total number of orders exceeded 1.03 million single. In addition, Wenzhou Telecom has set up the 'One Key' platform with 63,000 users, and as of 2024, more than 40,000 sets of home safety protection equipment have been sold.

2.2. Weaknesses

2.2.1. Technological divide between urban and rural areas and groups

Currently, the coverage rate of intelligent elderly care equipment in rural areas of Wenzhou is only 28.7%, much lower than the average level of Zhejiang Province (52.4%), of which the old community due to the building age (80% built before 2000), pipeline aging, circuit load and other objective conditions, the installation rate of intelligent equipment (11.2%) is only 1/3 of the newly built urban community (36.5%). research data show that The research data shows that the elderly with low education level (42.3% of primary school and below) generally have obstacles to the operation of smart devices, and 83.6% of the elderly over 65 years old can't independently complete the charging of smart bracelets, and 72.4% of them don't know how to use the emergency call function, which directly leads to the idleness rate of 25.8% of the smart meter monitoring equipment equipped in some commu-

nities (the original design usage rate should be more than 90%). Tongling Mountain Town, Wencheng County, for example, 2022 pilot installation of 50 sets of intelligent smoke alarms due to insufficient 4G network coverage in mountainous areas (only 61.2%), signal strength is weak (-90dBm or less accounted for 38%), resulting in the system's false alarm rate soared to 40.3%, the cost of operation and maintenance exceeded the budget by 127%, the project was forced to abort after 8 months of operation. Economic factors also constrain the popularity of the equipment, the sample survey shows that high-income groups with a monthly household income of more than 10,000 yuan smart elderly product usage rate of 75.4% (an average of 2.3 pieces of equipment per household), while low-income families with a monthly income of less than 3,000 yuan usage rate of only 14.9%, of which the price sensitivity (89.2% of the respondents believe that the equipment price is too high) and the subsequent service fee affordability (76.5 per cent could not accept an annual fee of more than RMB 200) were the main obstacles. This digital divide phenomenon is particularly prominent in urban and rural areas, such as Ou Hai District, Wutian Street, rural areas of the average household ownership of smart elderly care equipment (0.7 units) is only 1/3 of that of the neighbouring urban community (2.1 units), reflecting a multi-dimensional and systematic gap in infrastructure development, digital literacy cultivation, income levels, and other dimensions.

2.2.2. Professional talent gap and operating cost pressure

Currently, the elderly care service industry in Wenzhou region is facing serious dual challenges of talent and technology, and survey data show that only 12.3% of caregivers have basic intelligent equipment operation and simple troubleshooting ability, and the proportion of professionals who can carry out AIoT equipment system maintenance is even less than 15%. As a regional medical education town, Wenzhou Medical University, although it has been the first in the country to offer an undergraduate major in geriatrics and set up a minor course in smart aging since 2018, the complete training cycle is as long as 5-7 years as the training of composite talents requires the simultaneous mastery of interdisciplinary skills in clinical medicine, gerontological nursing, smart device operation and maintenance, and big data analysis. This lag in talent training and the explosive growth of market demand to form a sharp contradiction, according to the Wenzhou Civil Affairs Bureau 2023 statistics, the city's smart senior living organisations professional and technical talent gap has exceeded 2,000 people. In terms of hardware investment, the initial investment threshold of the smart elderly project remains high, for example, in the case of a typical intelligent transformation of family pension beds, the standard intelligent monitoring system contains millimetre-wave radar fall warning devices, non-contact vital signs monitoring mattresses, intelligent medication reminder terminals and other equipment, a single set of procurement costs up to 23,000-28,000 yuan, if you consider the subsequent maintenance of the system, the cloud services and regular equipment If subsequent system maintenance, cloud services and regu-

lar equipment updates are considered, the payback period generally takes 7.8-8.5 years. This high investment and slow return severely restricts the willingness of private capital to participate, resulting in the city's smart old-age care coverage rate of only 43 per cent of the planning target.

2.3. Opportunities

2.3.1. Technology Iteration and Model Innovation

Non-sensory health monitoring technology is constantly updated, such as millimetre wave radar, thermal imaging, smart carpet and other devices to achieve non-sensory monitoring of respiration, heart rate, falls, etc., such as the non-contact vital signs monitor from Fujitsu in Japan, and the Collie R1 fall detection product from ThingX Technology, which has dramatically lowered the rate of false alarms. Another example is the smart toilet equipped with a urine detection chip, which can screen for diabetes and urinary tract infections, and the data is synchronised to the family doctor for early warning of diseases. Using China's drone advantage, the community deployment of emergency drones, within five minutes to deliver AEDs, haemostatic kits, Shenzhen has piloted the 'first aid drone air-drop system'. Cognitive impairment intervention technology innovation, the use of VR cognitive training through customised virtual scenarios to delay Alzheimer's disease, Oxford VR clinical trials in the UK showed that the effect is better than traditional training. Non-invasive brain-computer interface head ring improves mild cognitive impairment through neurofeedback training, such as the product of BrainCo in China.

2.3.2. Silver Economy and Consumption Upgrade

Wenzhou, Zhejiang Province, as an economically developed region, has a growing group of high-net-worth seniors, as evidenced by the fact that 18 per cent of seniors have household assets of more than RMB 5 million, a significant proportion that highlights the group's strong purchasing power and demand for high-quality senior care services. Of particular concern is their strong demand for high-end intelligent senior care products, as evidenced by cutting-edge technology products such as intelligent rehabilitation robots and artificial intelligence nutritionists. These products, by virtue of their intelligent and personalised features, can effectively improve the quality of life and health of the elderly, and are therefore highly favoured, and the market has shown high growth, with an average annual growth rate of more than 35% for related products, signalling a huge market potential. At the same time, Wenzhou is actively exploring the deep integration of recreation tourism and intelligent ageing, making full use of its unique natural resources, especially the national scenic Yandang Mountain and the beautiful Nanxi River and other high-quality tourism resources, and innovatively developing a forest recreation project combining 'AI guide + health monitoring'. Through the introduction of AI technology, the project provides intelligent guiding services for elderly tourists, and at the same time, it is equipped with advanced health monitoring equipment, which monitors the physical

condition of the elderly in real time and provides personalised health advice, realising the organic combination of tourism and health management. With its unique attraction, the project has successfully received more than 800,000 senior tourists in 2024, which not only significantly improves the economic benefits of Wenzhou's tourism industry, but also provides the elderly with a healthier, more comfortable and intelligent recreational tourism experience, becoming a major highlight in the development of Wenzhou's intelligent senior care industry, and providing other regions with successful experiences that can be learnt from.

2.4. Threats

2.4.1. Market competition and risk of homogeneity

Wenzhou's smart senior care industry experienced significant expansion between 2020 and 2023, with the number of market players climbing from less than 50 at the beginning to more than 150, achieving a three-fold increase in scale. There is a high degree of functional convergence in the field of smart wearable, with more than 70% of the health monitoring devices developed by enterprises focusing on basic modules such as heart rate, step count, positioning, etc., and most of the manufacturers use standardised moulds to carry out simple appearance modification. The vicious competition in the market has led to a continuous decline in the profitability of the industry, and the overall profit margin has shrunk by nearly half in three years, with more than 30% of the business entities falling into a micro-profit predicament. Operators in the industry chain restructuring to form a double oligopoly pattern, China Telecom relying on physical outlets to build a territory-wide senior care service platform, in the broadband cable with the help of radio and television networks to implement the terminal equipment penetration strategy, the two joint control of the regional market share of 60%. Small and medium-sized manufacturers face multi-dimensional development barriers, 40% of the annual operating income of less than 5 million yuan order of magnitude, both the lack of core technology breakthrough capabilities and subject to channel expansion bottlenecks, this structural wenzhou wisdom of the senior care industry in 2020 to 2023 experienced a significant expansion of scale, the industrial ecology presents accelerated reconstruction trend. From the point of view of the scale of the market body, the number of registered enterprises from the early 2020 less than 50 quickly climbed to the end of 2023 more than 150, the average annual growth rate of up to 44.7%, to achieve a three-fold scale growth. In terms of segmentation, there is obvious functional homogenisation in the smart wearable device manufacturing segment. Market research data shows that 72.3% of the functional modules of health monitoring devices developed by enterprises are focused on basic functions such as heart rate monitoring, step counting, GPS positioning, etc., of which 89% of the vendors have adopted standardised male moulds to carry out simple cosmetic modifications, and differentiate their products only through colour schemes and LOGOs. This low level

of repetitive competition has led to a continuous decline in the overall profitability of the industry. According to the statistics of the tax department, the average sales profit margin of the industry has declined from 18.6% in 2020 to 9.8% in 2023, a shrinkage of 47.3%, of which 34.2% of the profit margin of the main business entities has fallen below the break-even point of 5%. In the process of industry chain reconstruction, the operator camp has formed a typical double oligopoly competition pattern: China Telecom relies on the city's 126 business hall outlets to build a 'Tianyi senior citizenship' service platform, integrating 47 aging service functions; China Broadcasting Corporation Cable, with the help of radio and television network subscriber base to implement the 'Guanghuiwanguijia' terminal penetration strategy, through the built-in way of the set-top box covers 82% of the elderly TV user groups. The two operators jointly control 61.5% of the regional market share through equipment procurement and service bundling. At the same time, small and medium-sized manufacturers generally face multi-dimensional development difficulties, industry association surveys show that 41.7% of the annual operating income of enterprises below the threshold of 5 million yuan scale, the average value of R & D investment intensity of only 3.2%, both the lack of breakthroughs in the accuracy of sensors, algorithms optimisation and other core technologies, and in the expansion of the channel is subject to operator-led purchasing system, the structural contradictions led to industrial innovation This structural contradiction has led to the industrial innovation index being lower than the average level of the Yangtze River Delta region for three consecutive years, which significantly restricts the kinetic energy of industrial transformation and upgrading. The contradictions have significantly weakened the momentum of industrial innovation.

2.4.2.Lack of standards and regulatory lag

Wenzhou region's smart elderly care products have obvious deficiencies in standardisation, with a standard coverage of only 38.7%, much lower than the national average. Taking smart mattresses as an example, due to the lack of a unified body pressure distribution algorithm standard at the national level, there are significant differences between brands in core functions such as pressure point identification and position change reminder. Third-party testing data shows that the deviation rate of its monitoring results is as high as 32.5% to 35.8%. The current industry regulatory system also needs to be improved. Some enterprises adopt the business model of 'obtaining cooperation rights at a low price, and then making profits through high-priced additions' to avoid regulation, and often make profits through bundled service sales and mandatory replacement of accessories at a later stage. The General Administration of Market Supervision data show that in 2024, the number of complaints in this area increased by 65.2% year-on-year, of which 47.3% of the complaints related to service quality. These problems not only affect the user experience, but also hinder the standardised development of the smart elderly industry. There is an urgent need to establish a unified product technical standard

system and build a regular regulatory mechanism covering the whole industry chain.

3. Reflections on the Development Strategies of Wenzhou's Intelligent Elderly Market

3.1. Accelerating urban-rural integration and transformation

In terms of financial support, it is recommended that a 50 per cent government subsidy policy be implemented; in terms of infrastructure, the promotion of the 'photovoltaic energy storage' model of integrated intelligent elderly housing is recommended to effectively solve the problems of energy supply and network coverage. Take the Yongjia County 'photovoltaic retirement home' demonstration project as an example, which integrates photovoltaic power generation, 5G communications and intelligent security systems, reducing the cost of single-family renovation by 40 per cent. Differentiated support policies are implemented for different elderly groups: the implementation of the 'intelligent equipment leasing programme' for families with financial difficulties, which combines a deposit of 500 yuan, a monthly rent of 30 yuan and a 50% government subsidy; the development of 'sensorless' monitoring equipment for the elderly and the incapacitated (e.g., millimetre-wave radar respiratory detector, plantar pressure sensing mats, etc.), which achieves a zero operating threshold; the development of wearable electromyography monitoring devices for the incapacitated elderly, which can be used for the elderly by means of myoelectricity monitoring. We have also developed a wearable EMG monitoring device for the elderly with disabilities, which achieves an 85% accuracy rate in fall prediction through EMG signal analysis. In terms of cognitive impairment intervention, we have used AI visual analysis technology combined with multi-dimensional behavioural data (including activity trajectory, sleep cycle, etc.) to provide six-month advance warning of Alzheimer's disease risk.

3.2. Creating a localised industrial ecosystem

Firstly, to give full play to the effect of Wenzhou's industrial clusters, with the Oujiangkou Intelligent Elderly Industry Demonstration Zone as the carrier, focusing on promoting the large-scale production of millimetre-wave radar sensors, intelligent health monitoring mattresses and other key components, which is expected to achieve 30% cost optimisation; secondly, to innovate the service model and implement the 'Community Intelligent Nursing Care Equipment Sharing Plan', which will increase the coverage of a single robotic service to the 5-kilometre radius, and reduce the operating cost by 60%. Secondly, innovate the service model and implement the 'Community Intelligent Nursing Equipment Sharing Programme' to reduce operation costs by 60% by increasing the coverage of a single robot to a 5 km radius. In terms of talent cultivation, it is recommended that local higher vocational colleges and universities, such as Zhejiang Dongfang Vocational and Technical College,

should set up a professional college of intelligent recreation and nursing, implement the 'dual system' cultivation programme (one year of on-campus learning and one year of enterprise practice), and carry out vocational skills certification training for the maintenance of AI equipment and the application of intelligent technology. In addition, a technical standard system in line with regional characteristics should be established, focusing on the development of intelligent interaction systems in Wenzhou dialect, to solve the technical application problems caused by obstacles in the use of Putonghua by elderly groups in remote areas.

3.3. Leveraging smart scenario-based models

Technological means have opened up new paths for improving the quality of life of the elderly, and the elderly care model under the meta-universe vision has demonstrated a unique value space. In particular, virtual reality technology is being integrated into the service system in an unprecedented way, providing brand-new programmes to empower the ageing group. Through the immersive construction of virtual environment, the spiritual world of the elderly can be significantly enriched, and the highly realistic regional cultural landscape, such as the digital reproduction of Wenzhou characteristic scenes, the past prosperity of Wumajie, and the serenity of Jiangxinyu Island can be felt without leaving home to experience the time and space travelling and revisit the old days, which can greatly alleviate the psychological disconnection and the sense of social loss brought about by the mobility difficulties. In addition to this, Yuan Universe also expands the maintenance of their physiological functions, with custom-designed virtual sports fields that suit different individual physical conditions, guiding them to participate in physical activities in a safe and fun environment, and incorporating sports data into a personalised health management framework.

At the same time, roles such as Artificial Intelligence (AI) dietitians are introduced, combining genetic testing and metabolism data to tailor personalised recipes for the elderly, and monitoring their dietary intake in real time through intelligent equipment to provide professional dietary guidance, so that the elderly can enjoy professional fitness and nutrition services without leaving their homes, and thus effectively improve the health of the elderly. In addition, we should also actively explore new forms of silver-hair economy under the meta-universe model of elderly care, and innovate the mode of elderly care services. For example, we can learn from the concept of 'time bank', and convert the behaviour of the elderly in participating in virtual sports, completing healthy recipes, learning health knowledge, etc. into points, which can be exchanged for preferential leasing of intelligent equipment or discounted services of high-end elderly care institutions. enjoy the discount services of high-end pension institutions, encouraging the elderly to actively participate in the activities of Yuan Universe Pension, thus forming a virtuous cycle, stimulating the consumption potential of the elderly group, promoting the innovative development of the pension industry, and ultimately building a Yuan Universe Pension Ecosystem

integrating cultural entertainment, health management, social interaction and economic activities, providing the elderly with richer, more convenient and personalised pension Service.

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