

Research on the “On-Demand Creation” Service Paradigm of Elderly Education Resources Driven by Generative AI: A Case Study of Smart Life Skills Training

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Abstract: With the acceleration of global aging, the population aged 60 and above in China has exceeded 280 million, and the contradiction between the digital skills demands of the elderly and the supply of static and universal educational resources has become prominent. This article conducts an in-depth study on the “on-demand creation” model of elderly education resource services driven by generative AI. This study proposes an “on-demand creation” service paradigm based on generative AI, providing suitable resources for elderly intelligent life skills training through demand perception, content generation, and dynamic optimization mechanisms. From the perspective of technological philosophy and service science, deconstruct the core element logic of the paradigm to demonstrate its dual value in reconstructing the theoretical framework of elderly education and promoting practical transformation. This research indicates that this paradigm provides systematic theoretical support for the innovation of elderly education services through a balance between technological empowerment and humanistic care, helping the elderly master modern information technology and life skills, enhancing their self-care ability and social participation, and better adapting to life in the digital age.

Keywords: Generative AI; On-demand creation; Elderly education resource service; Smart living skills

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1. Introduction

1.1. Research background

According to the data released by the United Nations in the *2023 World Population Aging Report*, the proportion of people aged 60 and above in the global population has reached 16%, with a significant aging trend. In China, the population aged 60 and above exceeds 280 million, accounting for 19.8% of the total population, and the degree of aging continues to deepen. At the same time, the digital wave is sweeping across, and the rise of

various entertainment software such as Douyin, Kuaishou, and Xiaohongshu has made live-streaming sales and entertainment hosts new career paths. The number of elderly internet users is increasing day by day, with a scale exceeding 300 million, but less than 40% of them truly master digital skills.

At present, there are several problems in the supply of elderly education resources: First, the forms of resources are monotonous, mostly presented in static forms such as standardized courses and paper-based materials, with slow content update speed; second, the interactivity is seriously insufficient; third, the dialect adaptability is low, making it difficult to meet diverse learning needs. These problems have created many obstacles for the elderly in integrating into the digital society.

The breakthroughs in generative AI technologies, such as multimodal content generation and personalized algorithm recommendation, provide technical possibilities for resolving the contradiction between supply and demand of resources. Their dynamic generation and precise adaptation characteristics are highly consistent with the personalized needs of elderly education, and it is urgent to explore their application paths in theory and practice.

1.2. Research significance

1.2.1. Theoretical significance

This research breaks through the traditional theoretical framework of “compensatory learning” in elderly education, and constructs a service paradigm with “demand center” as the core, enriching the cross-research dimension of technology empowerment and service innovation in the theoretical system of elderly education, providing a new perspective for the transformation of educational service paradigms.

1.2.2. Practical significance

By constructing and applying the “on-demand creation” paradigm, the personalized learning needs of the elderly can be precisely matched, enhancing the efficiency of training in smart living skills and helping the elderly bridge the digital divide. Meanwhile, the government, communities, enterprises, and other entities should collaboratively participate in providing practical guidance for elderly education services, promoting the digital transformation of the elderly education resource supply model.

1.3. Theoretical gap

In previous research on elderly education, the focus has mainly been on practical strategies, such as offering various forms of courses for the elderly and designing user-friendly interfaces for smart devices. However, systematic theoretical construction on the collaborative mechanism among “technology-service-users” has yet to be established. As the core framework guiding the supply of elderly education resources, the service paradigm is still in the exploratory stage of transformation in the AI era, and no consensus has been reached in the academic community. Therefore, in-depth theoretical analysis of the underlying logic of technology-enabled elderly education services has become an important research topic in the field of elderly education.

1.4. Research positioning and methods

This research, supported by generative AI technology, reconstructs the paradigm of elderly education services from a theoretical perspective. It aims to explore innovative approaches for the deep integration of technological rationality and humanistic values, providing a universal theoretical framework for the training of elderly people’s smart life skills, and promoting the transformation and development of elderly education service models.

2. Theoretical foundation and literature review

2.1. Relevant theoretical basis

2.1.1. Lifelong education theory

The concept of lifelong education was formally proposed by French educator Paul Lengrand in the 1960s. Its core idea is that education should run through a person's entire life, from birth to death, and that continuous learning is needed at all stages to adapt to the demands of social development and personal growth. The theory of lifelong education breaks the limitations of traditional education in terms of time and space, emphasizing the continuity, integrity, and openness of education. It holds that education is not only for acquiring knowledge and skills, but also for promoting the all-round development of individuals and the progress of society.

In the context of elderly education, the concept of lifelong education holds profound significance for the elderly. As an important period, most elderly people have experienced the changes in times. They are more willing to actively or even be forced to accept and learn new ideas and lifestyles in order to better adapt to the new era of life and enrich their spiritual life, and realize their value. Elderly education, as an emerging industry chain, has become an important part of the education system. The theory of lifelong education provides a solid theoretical foundation for the development of elderly education, prompting all sectors of society to pay more attention to elderly education, increase investment and support, and promote the continuous development and growth of the elderly education cause.

2.1.2. Cognitive development theory

Cognitive development theory mainly studies the process and mechanism of human cognitive ability development. Among them, the theories that have significant implications for elderly education include Jean Piaget's cognitive development stage theory and Raymond Cattell's fluid intelligence and crystallized intelligence theory.

Piaget's cognitive development stage theory holds that an individual's cognitive development is a continuous and staged process, divided into the sensorimotor stage, the preoperational stage, the concrete operational stage, and the formal operational stage. Although the cognitive development of the elderly has passed the formal operational stage, they have accumulated rich experience and knowledge through long-term life practice, forming a unique cognitive structure. In elderly education, the elderly tend to combine new knowledge and skills with their existing life experience when learning, and understand and master new knowledge through specific examples and situations. Understanding the cognitive structure and characteristics of the elderly^[1] is helpful for choosing appropriate teaching content and methods and stimulating their learning interest and enthusiasm. Therefore, in the training of smart life skills, teaching methods such as case teaching and situational simulation can be adopted to help the elderly better understand and apply the knowledge they have learned.

Cattell's fluid intelligence and crystallized intelligence theory points out that fluid intelligence refers to the ability demonstrated in information processing and problem-solving, such as the ability to recognize relationships, analogies, and deductive reasoning, which gradually declines with age; crystallized intelligence refers to the intelligence obtained through the acquisition of social and cultural experience, such as vocabulary, language comprehension, and common sense, which continues to grow throughout a person's life until old age when it begins to decline slowly. Crystallized intelligence keeps developing throughout a person's life and is related to education and culture, and does not decline with age, although the rate of development gradually slows down after the age of 25. This means that although the elderly may perform less well than young people in some tasks that rely on fluid intelligence, they have an advantage in crystallized intelligence and can use

their rich life experience and knowledge to solve problems. In elderly education, the advantages of the elderly's crystallized intelligence should be fully utilized, encouraging them to combine their existing knowledge and experience with new learning content to improve learning outcomes. At the same time, appropriate training and learning can also be carried out to delay the decline of fluid intelligence and promote the maintenance and improvement of the elderly's cognitive abilities.

2.1.3. Personalized learning theory

Personalized learning theory emphasizes a learner-centered approach. It provides individualized learning resources, paths, and teaching methods based on learners' unique differences, such as learning styles, interests, knowledge levels, and learning goals, to meet their specific needs and promote their optimal development.

In elderly education, generative AI technology can offer strong support for achieving personalized learning. By analyzing the learning data of the elderly, generative AI can provide them with practical tutorials and operation guides for smartphones and smart home appliances, accurately understanding each elderly person's learning needs. It can also customize the difficulty level of learning content based on their progress and mastery of knowledge, helping them consolidate their learning. Additionally, generative AI can offer learning guidance and feedback based on various problems encountered during the learning process of the elderly, enhancing their learning experience and satisfaction, and enabling them to master the use of generative AI technology unconsciously.

2.2. Research status at home and abroad

2.2.1. Research on the integration of generative AI and education

Foreign research has explored the application of generative AI in education relatively early, such as using GPT technology to develop intelligent tutoring systems, achieving dynamic generation of learning content and personalized interaction. In the field of elderly education, Australia's "Digital Seniors" project, by organizing volunteers to provide one-on-one digital technology training for the elderly, effectively enhanced the digital skills of the elderly. However, such studies mostly focus on the realization of technical functions and lack a systematic theoretical construction of paradigms.

In recent years, domestic research has mostly focused on the potential of generative AI in elderly education. For instance, Wang proposed that AI could enhance the efficiency of elderly educational resource supply. However, the existing studies mainly concentrate on the application level of technology^[2], lacking in-depth exploration of the "demand response–resource generation–service optimization" paradigm design, especially in the theoretical gaps regarding the collaborative mechanism among multiple subjects and the adaptation of age-friendly technologies.

2.2.2. Research on the supply of elderly education resources

Foreign research has developed relatively mature resource supply models. The elderly education model of American community colleges achieves a diversified supply by integrating social resources, and the "Action Plan for Elderly Education" released by the European Union emphasizes the combination of policy guidance and technological empowerment^[3]. However, such research has insufficient exploration of the "on-demand creation" mechanism driven by generative AI, making it difficult to meet the personalized learning needs of the elderly population.

Domestic research focuses on the localization of elderly education resources. For instance, Wu *et al.*

proposed the construction of a “learning-oriented elderly care” service system^[4], but the resource supply is still dominated by standardized courses led by the government, which have long update cycles and low adaptability. Liu *et al.* proposed course development strategies from the perspective of active aging, but they did not fully integrate the technical characteristics of generative AI and lacked theoretical designs for dynamic generation and intelligent optimization^[5].

2.2.3. Research on smart life skills training

In foreign research, scenario-based teaching and virtual reality technology are widely applied in the training of smart living skills. Schmidt *et al.* conducted health training for the elderly through immersive VR^[6], but the in-depth application of AI technology in content generation and personalized adaptation remains limited.

Most domestic research has focused on the improvement of traditional teaching methods. Hou proposed the realization path of smart education in elderly education at the Open University, but there is a lack of systematic research on the “on-demand creation” training model driven by generative AI, especially in terms of theoretical support for special needs such as dialect adaptation and cognitive feature matching in elderly education^[1].

Current research deficiencies: Although domestic and international studies have accumulated certain achievements in the application of technology and resource supply models, a theoretical system of “on-demand creation” services centered on generative AI has not yet been formed. This is specifically manifested in the following aspects: Firstly, there is a lack of systematic deconstruction of the “technology-service-user” collaborative mechanism; secondly, the characteristics and personalized needs of the elderly cognitive group have not been fully integrated; finally, the theoretical construction of a value network based on multi-agent collaboration is missing. This study aims to address the above deficiencies by constructing an elderly education service paradigm that integrates technology empowerment, demand response, and multi-agent collaboration.

3. Analysis of the current situation and problems of elderly education resource services driven by generative AI

3.1. Current development status

3.1.1. Introduction of a policy support system

In recent years, China has introduced a series of policies to promote the digital development of elderly education. For instance, in 2023, China issued the *Guiding Opinions on Promoting the Digital Development of Elderly Education*, explicitly stating the need to “explore the application of artificial intelligence and other technologies in elderly education.”

3.1.2. Gradual exploration of technical application practices

Some communities and educational institutions have attempted to apply AI technology to elderly education, piloting AI-generated elderly education courses. They have used ChatGPT to create tutorials on smartphone applications and employed Stable Diffusion to produce age-friendly graphic and textual resources for promotion. The “AI for the Elderly” project carried out in Chaoyang District, Beijing, utilized generative AI technology to produce dialect versions of smartphone usage tutorials, increasing the coverage rate by 30% (Data source: Beijing Municipal Office for Aging, 2024).

3.1.3. Evident trend of diversified service providers

Government, communities, technology enterprises, and other entities have begun to collaborate in providing

elderly education services, forming an initial model of “online technology empowerment + offline service support.” For instance, in Shanghai, the “Silver Digital Classroom” combines AI-generated video tutorials with community volunteer guidance, achieving an 85% satisfaction rate among the elderly.

3.2. Existing problems

3.2.1. Imbalance between supply and demand of resources

Data shows that in China’s elderly education resources, standardized courses account for over 70%, while personalized resources for dialect-speaking groups and low-educated seniors are less than 15% (Data source: 2024 Elderly Education Resources Survey Data). Traditional static resources are hard to meet the dynamic demands of the elderly in scenarios such as operating smart devices and identifying fraud, leading some seniors to give up learning due to the low content adaptability.

3.2.2. Insufficient depth of technology application

The current application of generative AI in elderly education mainly remains at the level of simple content generation. Most AI-generated tutorials do not take into account age-friendly designs, such as font size and speech speed. Moreover, they lack the ability to identify and provide targeted guidance for errors made by the elderly during operation, resulting in limited technological empowerment effects. There is also a lack of deep adaptation to the cognitive characteristics of the elderly, such as memory decline and visual impairment. At the same time, the technical usage threshold may exclude some elderly people. Data shows that among those over 75 years old, only 28% can independently use AI educational applications (Data source: China Internet Society, 2024).

3.2.3. Monotonous service model

The current elderly education services still mainly follow a one-way model of “institutional supply–elderly reception,” lacking a feedback mechanism for demands and dynamic optimization. A case study shows that after the Chinese Elderly University adopted AI-generated resources, due to the absence of a user feedback channel, 60% of the elderly felt that the “practicality of the resources” was insufficient (Data source: 2019–2020 China Elderly Education Development Report). In addition, the collaborative mechanism among the government, communities, and enterprises is not well established, leading to low efficiency in resource integration and making it difficult to form a combined force in elderly education resource services.

4. Theoretical construction of the “on-demand creation” service paradigm

4.1. Definition of core concepts

The service creation of “on-demand creation” is achieved through advanced technologies such as big data analysis and artificial intelligence to accurately capture educational demands, and then quickly combine and develop new resources and services by technical means. Its essence lies in being demand-oriented and flexibly applying educational technologies to achieve real-time generation and optimization of resources and services. In the existing resource services, there are problems such as untimely resource updates, inability to precisely match individual needs, and a single service model. “On-demand creation” precisely addresses these issues, aiming to build a more timely, personalized, and diverse elderly education resource service system ^[7] to meet the constantly changing educational demands. In elderly education, on-demand creation takes elderly users as the service targets, with their demands as the core driving force. It uses AI technology to analyze the learning

characteristics of elderly users and dynamically form resources that are compatible with elderly education. Considering that most elderly people prefer to communicate in dialects, it creates dialect versions of exercise guides and generates scenario-based simulation training content based on real-life scenarios.

In terms of paradigm elements, it mainly includes three levels: the technology empowerment layer, the service process layer, and the value network layer (see **Figure 1**). The technology empowerment layer relies on AI technologies such as ChatGPT to achieve intelligent generation capabilities of multi-modal content, thereby providing diverse technical support for elderly education resources. The service process layer ensures that elderly education services can accurately identify the personalized needs of the elderly by building a closed-loop service process of “demand perception–intelligent matching–dynamic optimization.” The value network layer needs to establish a supply mechanism with the collaborative participation of multiple parties, such as the government, communities, and enterprises, integrating the resources and advantages of all parties to form a comprehensive and multi-level elderly education service ecosystem model.

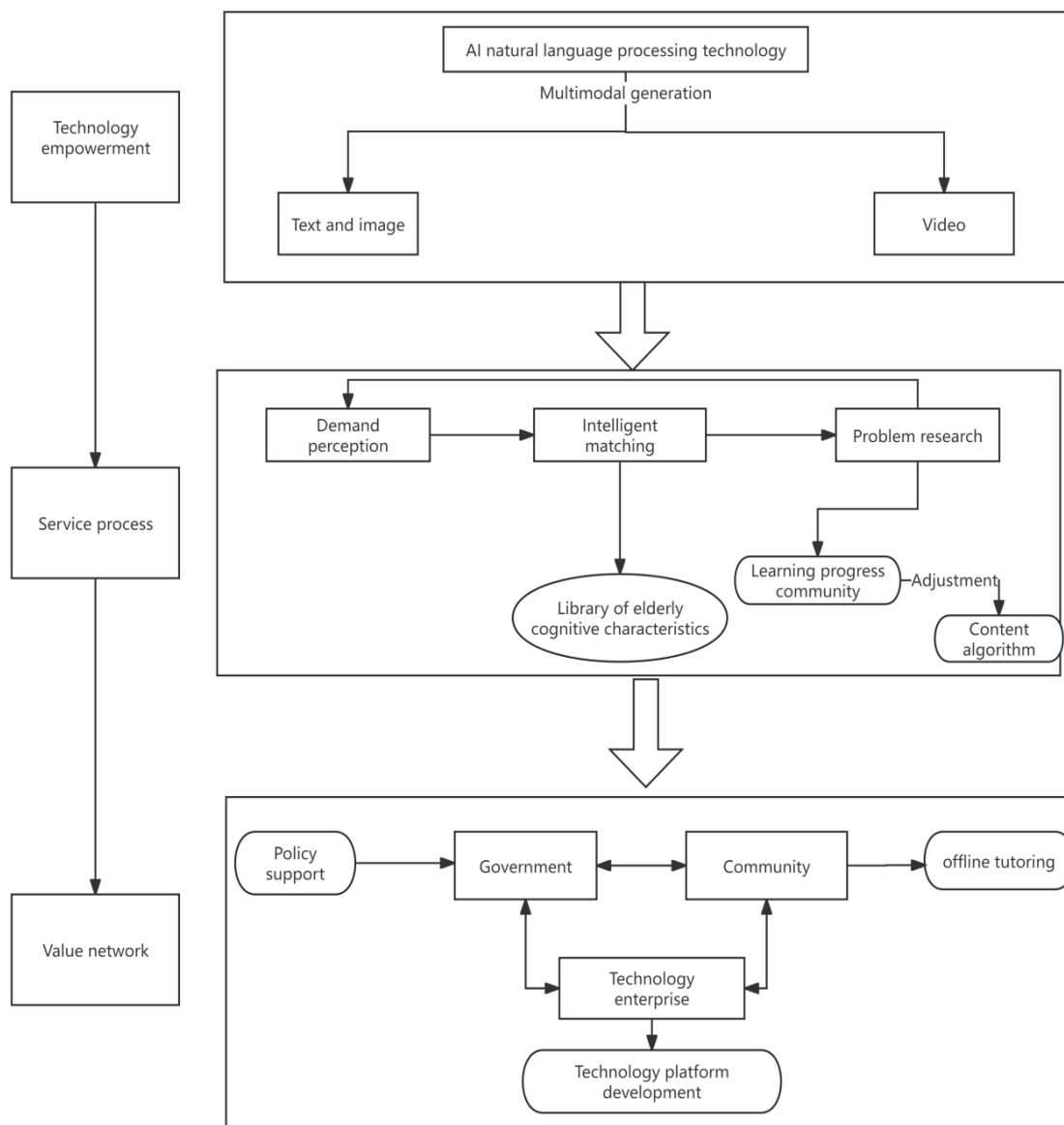


Figure 1. Process flowchart of paradigm elements

4.2. Construction principles

This research builds a theoretical model based on the principles of demand orientation, technology empowerment, multi-party collaboration, and people orientation. From the perspective of the demand orientation principle, it takes the personalized needs of the elderly as the core driving force, and through multi-dimensional perception, such as explicit demand questionnaires and implicit demand behaviors, ensures that the generated resources and services are precisely matched to the learning and cognitive characteristics of the elderly. From the perspective of the technology empowerment principle, it fully leverages the technical advantages of generative AI, such as multi-modal content generation, intelligent recommendation, and dynamic optimization, to achieve real-time generation and adaptive adjustment of educational resources. From the perspective of the multi-party collaboration principle, it establishes a multi-party collaborative participation mechanism involving the government, communities, enterprises, and elderly users, integrating policy support, technology development, and offline service resources to form a “virtual-real integration” educational ecosystem. From the perspective of the people-oriented principle, it focuses on the learning experience and feelings of the elderly, designs humanized service interfaces and interaction methods, provides convenient, efficient, and warm educational resource services, and enhances the learning enthusiasm and satisfaction of the elderly.

4.3. Theoretical model construction

According to the three-layer architecture diagram of the “on-demand creation” paradigm (**Figure 2**), in the technology-enabled layer, when elderly users raise the demand of “how to bind a medical insurance card,” AI technology can quickly invoke relevant models to generate educational resources in the form of images, text, or videos, which are presented intuitively to the elderly.

At the service process layer, it is further refined into three levels. By adopting diversified demand perception methods, not only are the explicit demands of elderly users collected through questionnaires, but also their implicit demands are mined by analyzing device operation logs. For instance, the repeated clicking of the same button by elderly users reveals the underlying learning difficulties and demands. Based on the elderly cognitive feature library, which includes personalized information such as elderly users’ preferences for font size and the degree of memory decline, the learning demands of the elderly are perceived to intelligently match the most suitable educational resources for them, ensuring the adaptability and effectiveness of the resources. According to the learning progress and actual mastery of elderly users, the difficulty of learning content is dynamically adjusted from basic “QR code scanning operations” to more complex “online payment” and other learning contents, achieving intelligent matching.

The value network layer forms a tripartite interactive service model. The government provides support at the policy level, such as formulating relevant policies to encourage social forces to participate in elderly education; communities leverage their organizational advantages to conduct offline tutoring activities and offer face-to-face learning assistance to elderly users; technology enterprises focus on the development of technical platforms, providing advanced AI technologies and tools. The three parties collaborate in synergy to create a “virtual-real integration” elderly education service ecosystem.

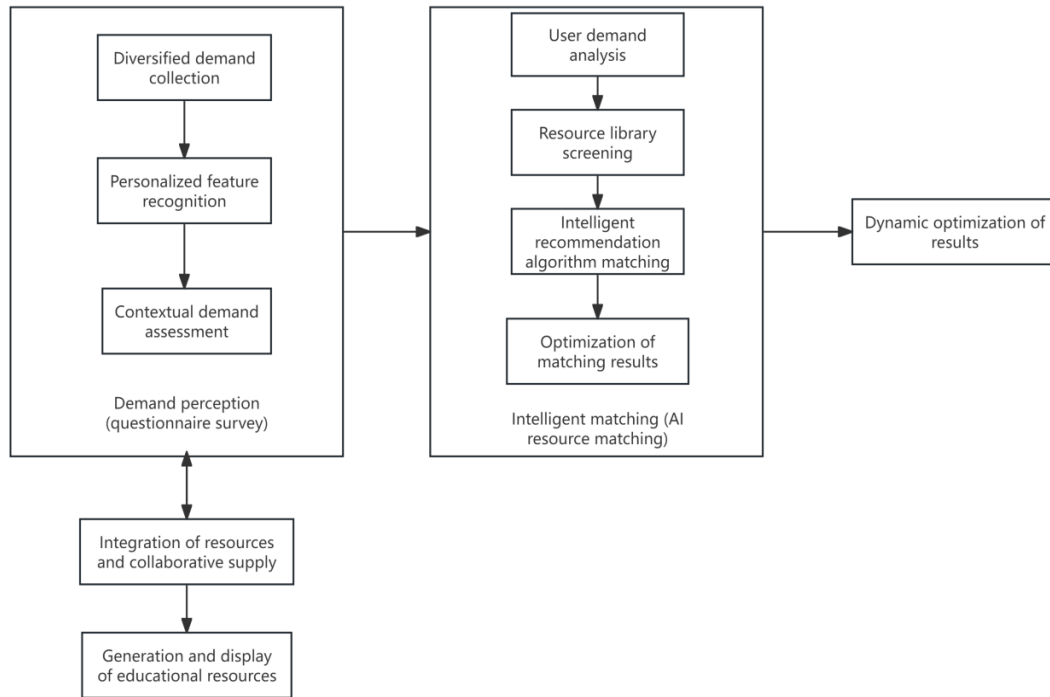


Figure 2. Theoretical model construction diagram

5. Empirical research with smart life skills training as an example

5.1. Research scheme design

5.1.1. Research objectives

Verify the effectiveness of the “on-demand creation” service model in the training of smart living skills for the elderly, explore the application paths of generative AI technology in demand perception, resource generation, service optimization, and other links, and analyze the practical effects of the multi-subject collaborative mechanism.

5.1.2. Research subjects

A total of 120 elderly people aged 60 and above from a certain community were selected, including 52 men and 68 women, with an average age of 68.5 years. Stratified sampling was conducted based on educational attainment and digital skills level to ensure the representativeness of the sample.

5.1.3. Research methods

Action research method: The cycle of “demand analysis–resource generation–training implementation–effect evaluation” was carried out in three rounds for continuous improvement.

Questionnaire survey method: Self-made questionnaires, namely “Training Demand and AI Resource Utilization Survey for Elderly Smart Life Skills” and “AI Satisfaction Survey,” were used for pre- and post-tests.

Case tracking method: 20 elderly people with different characteristics were selected for in-depth interviews to record the learning process and feedback.

5.2. Implementation process

5.2.1. Demand research and analysis

Through a questionnaire survey (with a valid recovery rate of 92%) and analysis of equipment operation logs (collecting one month's operation data of 120 elderly people), it was found that the core demands of the elderly group in terms of smart living skills include (**Figure 3**): (1) Basic operations of smart phones (such as scanning codes and making payments), accounting for 61.29%; (2) Anti-fraud identification (such as fraud text messages and phone calls), accounting for 61.29%; (3) The demand for dialect adaptation, accounting for 77.42% (mainly for local dialect voice guidance).

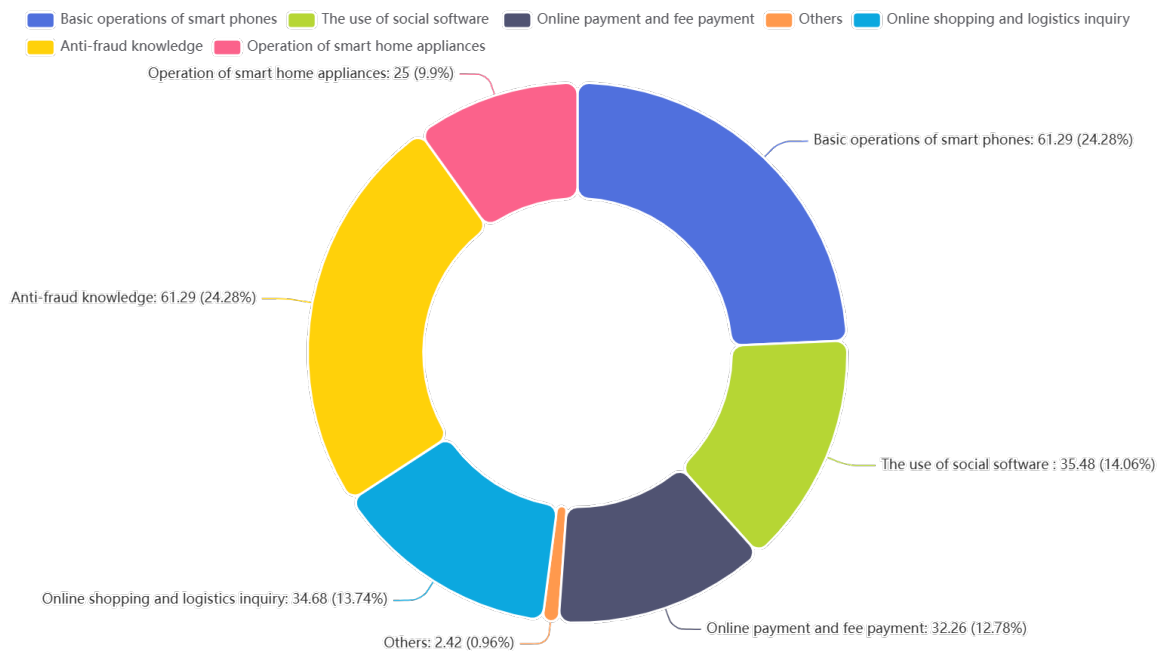


Figure 3. Smart life skills map

5.2.2. Resource generation and adaptation

Based on the demand analysis, three types of resources are generated by using generative AI technology: multimodal tutorials: GPT-4 is used to generate bilingual voice tutorials in Mandarin and dialects (such as Sichuanese and Cantonese), and Stable Diffusion is used to generate large-font, high-contrast graphic steps; anti-fraud scenario simulation: AI is used to generate dialogue scripts for common fraud scenarios (such as “medical insurance fraud” and “prize notification”), and an interactive simulation training tool is developed. Elderly people can conduct anti-fraud drills through voice interaction; personalized reinforcement packages: reinforcement content is automatically pushed based on the learning progress. For elderly people with high error rates in “QR code payment” operations, special training resources of “voice broadcast + decomposed actions” are pushed.

5.3. Analysis of implementation effects

Through in-depth interviews, it was found that the elderly's recognition of the “on-demand creation” model

mainly lies in: (1) “The tutorials are ‘tailor-made,’ and the parts I don’t understand will be taught repeatedly”; (2) “The anti-fraud simulation is so realistic that now when I receive a fraud call, I can spot the flaws.” However, there are also some problems, such as 55.65% of the elderly having a resistant attitude towards AI technology, and more offline guidance is needed (**Figure 4**).

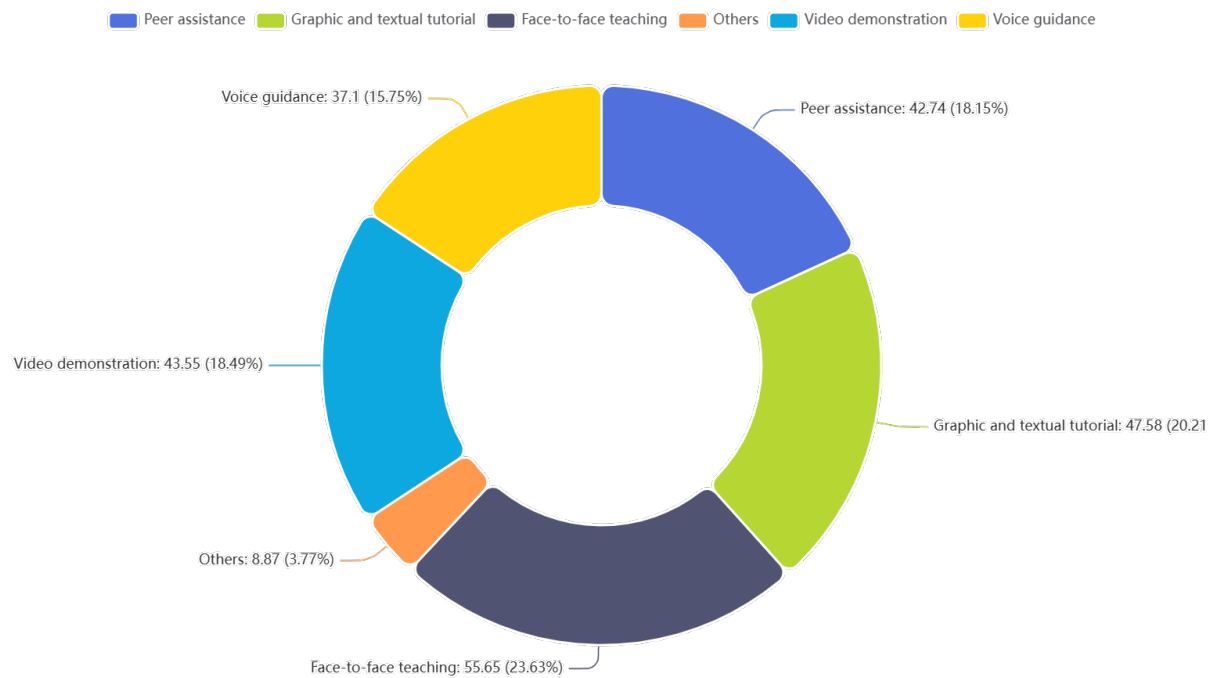


Figure 4. Learning preference mode diagram

6. Development strategies for on-demand creation of elderly education resources driven by generative AI

6.1. Strengthening technological research and development and adaptation for the elderly

To innovate the traditional educational theory framework for elderly education, the “on-demand creation” service paradigm breaks through the inherent framework model of traditional elderly education’s “compensatory learning,” and builds a theory of elderly education services centered on “demand.” Increase investment in R&D of the application of generative AI in elderly education, focusing on breakthroughs in technologies such as dialect recognition, emotion computing, and multimodal content adaptation, to achieve precise and humanized resource generation. Establish a dedicated security system for elderly education data, using blockchain technology to ensure the entire process of data collection, storage, and use is traceable, and strictly comply with the “Personal Information Protection Law,” anonymizing the learning behavior data of the elderly. At the same time, formulate the “Ethical Guidelines for the Application of Generative AI in Elderly Education,” standardize algorithm design, and avoid unfair resource generation due to data bias such as ignoring the needs of minority dialect groups.

Meanwhile, by deepening interdisciplinary research, the “on-demand creation” service paradigm is deconstructed from multiple perspectives of technology philosophy, service science, and sociological theories, promoting the cross-integration of multiple disciplines in the field of elderly education research.

The philosophical perspective, combined with Heidegger's theory of the duality of technology ^[8], provides theoretical support and caution for the rational application of generative AI; the service science perspective focuses on the transformation of elderly education service models; and the sociological perspective pays attention to the reconstruction of the "digital habits" of the elderly group ^[9]. This has expanded the theoretical boundaries of elderly education research and provided an example for interdisciplinary research.

6.2. Building a diversified and collaborative service ecosystem

It is recommended at the policy level that relevant departments formulate the "AI Generation Standards for Elderly Digital Educational Resources," standardizing the AI generation process of elderly digital educational resources, covering aspects such as content accuracy, age-friendliness, and security. Secondly, encouraging policies should be introduced to motivate different groups from various eras and social backgrounds to actively participate in the development of elderly educational resources, providing tax incentives and financial subsidies to enterprises and social organizations. This will mobilize the enthusiasm of all parties and form a diversified supply pattern of elderly educational resources. At the same time, a dedicated educational resource supervision institution should be established to conduct regular reviews and evaluations of AI-generated elderly educational resources, preventing algorithmic biases and other erroneous information. According to the economic development conditions of different regions, an elderly educational resource sharing platform should be established to facilitate the cross-regional flow of high-quality resources and narrow the gap in elderly education services.

At the technical level, increase investment in research and development, and widely adopt age-friendly features such as integrated dialect recognition, voice wake-up, large font display, simplified operation steps, and simple interface design to lower the threshold for elderly users to use AI tools. Also, enhance the identification of dangerous information and the blocking of advertisements, attach great importance to the security and privacy protection of elderly data, and establish strict data management systems and security protection mechanisms. When collecting data, clearly define data usage permissions and use encryption and anonymization techniques to prevent leaks, reducing the risks of online fraud and the spread of false information. Strengthen the transparency management of AI algorithms to ensure the explainability of the decision-making process, allowing elderly users to clearly understand the basis for resource generation and enhancing their trust in the technology.

From the perspective of educational institution services, elderly education institutions should transform their service concepts and integrate the "on-demand creation" concept into the entire educational service process. They should also strengthen the training of teachers and staff, enabling them to fully understand the application value and service methods of generative AI technology in elderly education, and flexibly utilize AI educational resources based on the needs of elderly users to provide personalized guidance and support. Secondly, in line with the "on-demand creation" service paradigm, the Xiaohuangxin elderly education model should be adopted to carry out blended teaching that combines online and offline methods. AI should be used to generate diverse learning resources, and offline activities should be strengthened to enhance interaction between teachers and students and provide practical guidance and operation. Of course, teaching strategies should be regularly revised based on the learning feedback of elderly users, and questionnaires and interviews should be used to promptly collect their learning experiences and suggestions for educational resources. The service strategies of educational resources should be adjusted in a timely manner to continuously optimize the application effect of the "on-demand creation" service paradigm in elderly education practice.

7. Conclusion and outlook

7.1. Research conclusions

The “on-demand creation” elderly education resource service paradigm successfully constructed in this study, through the deep integration of theory and technology, innovatively proposed the “technology empowerment–service reconfiguration–value co-creation” analysis model, enriching the theoretical system of educational technology, and providing a brand-new, scalable theoretical framework for elderly education. This paradigm, while meeting the personalized learning needs of the elderly group, has significant advantages in improving the quality of elderly education services and enhancing social participation.

Theoretically, it breaks through the traditional framework of “compensatory learning” in elderly education, constructs a theoretical system centered on demand response, and builds an analytical model of “technology empowerment–service reconfiguration–value co-creation,” enriching the theoretical content of elderly education service models. Methodologically, this paradigm establishes a closed-loop process of “demand perception–resource generation–service optimization” through precise demand perception, intelligent multi-modal content generation, and resource optimization mechanisms. It combines the multi-modal generation capabilities of generative AI with the cognitive characteristics of the elderly to achieve precise resource matching. Through multi-party collaboration among the government, communities, and enterprises, it has constructed a “virtual-real integration” service ecosystem.

At the practical and social levels, it is necessary to integrate the collaborative forces of the government, communities, enterprises, and other parties to help reshape the “digital habits” of the elderly and narrow the digital divide between generations. Empirical research, such as the training of smart life skills, shows that this model can increase the digital skills mastery rate of the elderly by more than 40%, with a resource satisfaction rate of 89%, effectively narrowing the digital divide.

7.2. Research prospects

Although this paradigm has demonstrated new potential, future research still needs to be deepened in the following directions to promote the continuous optimization and wide application of elderly education services in the future.

Firstly, it is necessary to explore the feasibility of applying the “on-demand creation” paradigm in different cultural contexts, especially for the elderly in remote areas and regions with minority dialects. This requires more precise adjustments to language recognition parameters, content, and form service processes, to adapt to different environmental, cultural customs, and digital infrastructure, ensuring the flexibility and applicability of the paradigm.

Secondly, attention should be paid to the ethical challenges faced by generative AI in elderly education. In the future, a systematic theoretical framework needs to be constructed to protect the rights and interests of the elderly, achieving a balance between technological empowerment and humanistic care. In the era of rapid technological development, the iteration and update speed of AI technology is accelerating. It is necessary to further explore the innovative application of new technologies such as multimodal large models and affective computing in elderly education. At the same time, based on the physiological and cognitive characteristics of elderly users and their usage feedback, more age-friendly AI tools should be developed to lower the usage threshold and enhance the digital information experience.

Finally, long-term tracking research should be conducted to evaluate the application effect of the “on-demand creation” service paradigm in elderly education. This includes the actual impact on the improvement

of digital skills among the elderly, the proportion of elderly people who are proficient in using digital tools, their degree of social integration, and their quality of life. Through a combination of quantitative and qualitative research methods, the value of this paradigm in narrowing the digital divide and promoting social equality at the macro level should be verified, providing more effective and solid evidence for policy and practical exploration.

Disclosure statement

The authors declare no conflict of interest.

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