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Research on the Innovative Balance Model Between Technology and Humanity in Science and Technology Elderly Care Entrepreneurship—From the Perspective of New Generation Business Model

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Abstract. The global aging population has been intensifying the demand for innovative elderly care solutions, with technology-driven entrepreneurship emerging as a key response. However, current approaches tend to prioritize technological progress over human factors, resulting in an imbalance in service delivery and a gap with real needs. This study explores the integration of technology and humanism in elderly care entrepreneurship through business model innovation, leveraging the Business Model Generation framework. Based on the framework of business model theory, this study proposes a technology-humanity balance model that emphasizes the integration of humanistic values into scientific and technological applications to meet the functional and spiritual needs of the elderly through case studies and theoretical integration. The findings highlight that business model innovation, especially through the value proposition and customer relationship dimensions of the Business Model Canvas, can effectively harmonize technological efficiency with humanistic care, achieve the dual drive of "function + emotion", provide practical reference for technology-based elderly care entrepreneurs, and contribute to academic discussion and practical application.

Keywords: Technology-driven elderly care, Technology-humanism balance, Business model innovation, Elderly care entrepreneurship

1. Introduction

The rapid aging of populations worldwide, particularly in China where the elderly population exceeds 300 million, has necessitated innovative approaches to elderly care [1]. However, numerous smart elderly care products demonstrate technological determinism, prioritizing technical specifications over considerations of seniors' physical limitations, cognitive diversity, and psychosocial needs. This approach lacks humanistic value and leads to low willingness among elderly users to adopt such products. For example, the toilet seat remote control operation of Rongshina is complicated, which is difficult for the elderly to master. This gap underscores the need for a balanced model that integrates technological innovation with humanistic care principles.

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This study focuses on three core issues: First, there is a realistic contradiction between technology empowerment and humanistic lack in technology-driven elderly care entrepreneurship. How to bridge the gap between technical efficiency and humanistic value through business model innovation? Secondly, what are the key dimensions of the technology-humanity balance model built on the business model canvas (BMC)? How do these dimensions form a closed-loop dynamic balance in the BMC framework? Finally, with the cases of Taikang Home·Yan Garden, European-Japan e-VITA project and “Nanyang Technology” student entrepreneurial team as samples, how to provide reference for the practical application of this balance model?

This study adopts qualitative methods, combined with literature analysis, business model generation method and multi-case study, based on the framework of BMC, analyzes the balance of value proposition, identifies commonalities through policies, enterprises and academic data, proposes a humanistic model of elderly care technology, fills the gap, provides solutions for entrepreneurs, and promotes the sustainable development of the industry.

2. The paradox of technological empowerment versus humanistic deficiency in elderly care innovation

According to the "China Technology-Driven Elderly Care Industry Development Report", the domestic market size of technology-driven elderly care services is projected to exceed 8.6 trillion yuan by 2024, with startup projects growing at an annual rate of 15%. Smart monitoring devices, AI companion systems, and telemedicine platforms are rapidly integrating into elderly care scenarios. However, beneath this industry boom lies a glaring imbalance between technological applications and humanistic needs, manifested in three key areas of conflict:

2.1. Over-pursuit of functional design, ignoring the physiological characteristics of the elderly group

For example, although a smart wristband product can monitor heart rate and track location in real time, the screen font is too small and the operation steps are complicated, resulting in the usage rate of users over 70 years old is less than 20%. The core contradiction is the overloading of functions and the lack of age-appropriate design.

2.2. The pursuit of efficiency by technology is in direct opposition to the need of the elderly for autonomy and dignity

For example, a "family monitoring system" developed by a startup company can share the activity data of the elderly in real time, but because the data permission classification is not set, the elderly feel "surveillance", and the user attrition rate is as high as 40%.

2.3. The conflict between large-scale service of technology and personalized emotional needs

For instance, an AI companion robot company that uses preset dialogue templates to cover 80% of daily scenarios received feedback from elderly users describing interactions as "like talking to a machine," with an emotional satisfaction score of merely 2.3 (out of 5). Research [2] indicates that seniors' need for emotional engagement far exceeds standardized services. However, current products demonstrate only 78% accuracy in emotion recognition, lack dialect adaptation capabilities, and fail to provide personalized responses.

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These findings reveal an industry-wide need to reconcile technological capabilities with humanistic considerations. Moving forward, we must adopt functional simplification strategies—such as one-touch emergency calls, voice-first interaction interfaces, and data privacy tiered management with activity-based access controls. Simultaneously, emotional algorithm optimization through dialect recognition and sentiment response integration will drive elderly care technology to transition from efficiency-driven approaches to human-centric solutions.

3. Theoretical framework: constructing the technology-humanity balance model based on business model theory

3.1. Analytical framework: applying the business model canvas for balanced innovation

The Business Model Canvas (BMC), as a strategic management tool, systematically deconstructs business models into nine interdependent components: Value Proposition, Customer Segments, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure. In the context of elderly care, this framework can be adapted to integrate technological efficiency with humanistic values.

3.2. Framework construction of technology-human balance model

Table 1. Comparison between the traditional model and the balanced model of the nine elements of the business model canvas

Nine essential elements	Traditional model	Balance model
Value proposition	Technical goal = safety + efficiency	Technology + humanistic goals (dignity, emotion, privacy, etc.)
Customer segmentation	Physiological labels (age, health) + rigid needs (disability, etc.)	Acceptance of technology + core needs (security/emotional/social, etc.)
Customer relations	After-sales maintenance, passive service	Active return visit + ability empowerment + emotional companionship
Channel access	Institutional cooperation + e-commerce	Technology adaptation + emotional trust (hardware adaptation for aging, emotional communication, trust building, non-pure commercial promotion)
Core resources	Technical team (algorithm + hardware)	A composite team of technology, social work and gerontology
Key business	Technology research, development and production	Technology-humanity integrated design products
Important cooperation	Technology hardware suppliers + pension institutions + e-commerce platforms	New cultural partners (psychological institutions + public welfare foundations + neighborhood committees + senior universities, etc.)
Income stream	Technology product sales + standardization services	Expand human value payment (such as customization, etc.)
Cost structure	Technology development, production and marketing	New human input costs

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Table 1 clearly demonstrates that, compared to traditional models, the technology-humanity balance model emphasizes that innovative business models for tech-driven elderly care must anchor in "humanistic needs". Technology should serve as a tool rather than an end goal, returning to its fundamental role of enhancing seniors' sense of dignity, security, and belonging. Among the nine elements of the business value canvas, value proposition, customer segmentation, and channel networks are critical factors for elderly care startups. These three components form a closed-loop dynamic equilibrium model: identifying needs through customer segmentation, defining direction via value propositions, and implementing channels through operational strategies. Entrepreneurs should assemble interdisciplinary teams combining technical expertise, social work professionals, and gerontological specialists. The core competitiveness of tech-driven elderly care ventures lies not in technological advancement, but in understanding elderly users as whole individuals with comprehensive human dimensions.

4. Practical cases of pattern innovation

4.1. Case 1: Taikang Home · Yanyuan (China)

Taikang Home·Yanyuan, a nationally accredited high-end elderly care facility in China, has established a globally relevant elderly care service system by deeply integrating business model innovation with the concept of balancing technology and humanism.

In Customer Relationships, Taikang Home·Yanyuan has built a multi-level, sustainable customer relationship system through AI-driven precision services and resident-governed community ecology. The intelligent service network, based on the Tai Le OS system, enables non-sensing collection and intelligent analysis of health data. For instance, smart mattresses monitor vital signs such as heart rate and respiration in real-time, with abnormal data automatically triggering warnings for family doctors; AI voice assistants provide personalized services like medication reminders and health report generation, replacing 70% of manual health management work.

This combination of technology empowerment and humanistic care not only improves service efficiency, but also protects the physical and mental needs of the elderly, demonstrating affective computing applications in eldercare.

4.2. Case 2: European-Japanese Virtual Coach for Smart Ageing (e-VITA)

The European-Japan Smart Aging Virtual Coach (e-VITA) project integrates cutting-edge technology with human-centered design to build an intelligent support ecosystem. By combining multimodal data fusion technology with an Emotion Detection System (EDS), it collects physiological, behavioral, and environmental data through wearable devices, home monitoring systems, and interactive robots. AI algorithms analyze voice patterns, facial expressions, and environmental cues to accurately detect emotional fluctuations and trigger personalized interventions. For instance, the system recommends social activities or connects users to virtual support groups based on tone variations, while dynamically adjusting cognitive training and mental guidance suggestions according to emotional states.

The project's core concept of "digital twin" creates real-time virtual replicas of users' lifestyles, preventing health decline and social isolation while enabling seniors to maintain emotional well-being and independent living. This initiative marks a paradigm shift from technology as mere replacement tools to humanistic care assistance, offering a replicable solution for global aging challenges through technological empowerment in emotional support.

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4.3. Case 3: the "Nanyang Technology" student startup team

The “Laolai Le” intelligent companion robot developed by the Nanyang Technology team at Hunan University of Finance and Economics integrates fall detection with emotional interaction capabilities. Supported by millimeter-wave radar, AI visual recognition, and over a dozen dialects, it precisely addresses health monitoring and emotional needs for Chinese seniors. Its AI module can identify seven emotions and generate personalized dialogues. In 2023, pre-sales of 500 units achieved 92% satisfaction, with 65% of users prioritizing emotional companionship. During the 2024 B2B pilot program, nursing efficiency increased by 30%, and seniors averaged 4.2 daily interactions. This project not only achieves precise health monitoring through technological innovation but also meets the deeper needs of elderly populations through culturally adapted dialect support and emotional engagement design, pioneering a new paradigm of technology-enhanced emotional care in senior services.

The team's core competitiveness lies in technological innovation and localized adaptation: By adopting domestic sensor alternatives, they achieved hardware costs 45% of imported products while developing a "family-specific dialect" learning feature that allows users to input personalized expressions like "mole-person demon" and "pressure-cooker dish", enhancing emotional resonance. The project won the Silver Award at the 2024 Hunan Province "Internet+" College Student Innovation and Entrepreneurship Competition and was selected as a key supported project in Xiangjiang New Area [3]. Changsha Evening News praised its business model as "balancing technological warmth with commercial rationality". Currently, the team is exploring collaborations with insurance companies to launch "health and wellness packages", aiming to integrate robotic services into pension insurance value-added benefits to establish a B2B2C ecosystem closed-loop. They are also addressing industry-wide challenges including health data ethics and elderly safety standards.

5. Implementation strategies and challenges of the technology-humanity balance model

5.1. The practical path of refining the balance model

5.1.1. Product level

The minimalist design approach retains core functionalities (e.g., one-touch operation) while eliminating non-essential features. Cultural adaptation, exemplified by dialect-based voice interfaces, enhances emotional connectivity.

5.1.2. Service level

A collaborative network integrating technology and human expertise enables AI-generated health reports, with social workers providing psychological counseling during interpretation. By establishing user-driven co-creation models that involve seniors in product iteration processes, we enhance their sense of being valued. We develop tailored solutions based on technical acceptance levels and core needs across different demographics. For example:

The “high-tech adoption + social engagement” group receives “smart social platforms + offline interest communities” services, including user-friendly video apps to help seniors document daily life and share experiences, complemented by regular offline events.

Meanwhile, the “low-tech adoption + safety assurance” group adopts a “family proxy operation + community support” model, where elderly users operate tactile interface emergency call systems

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with synchronized data to children's phones, receiving weekly home visits for data analysis and emotional support.

5.1.3. Ecological level

By integrating community, healthcare, and home environments-where communities provide equipment maintenance, hospitals interpret health data, and families engage in emotional interactions–technology serves as the bridge connecting these elements. Adopting a "humanistic approach" to business models, such as generating revenue through value-added services like customized emotional companionship rather than relying on data sales, helps preserve humanistic values from being eroded by commercial interests.

5.2. Challenges of the equilibrium model

First, standardized designs and algorithms in tech products struggle to fully address the diverse humanistic needs.

Second, the intangible nature of humanistic values poses challenges for technical evaluation systems.

Finally, humanistic involvement may increase costs for tech-driven elderly care. Nevertheless, the core competition in future tech-based elderly care will remain "human-centered" rather than purely technological.

By adhering to the principle that "humanistic needs define technological boundaries," we can achieve integration through de-technologization of value propositions, emotionalized customer relationships, and scenario-based channel development. As Marie-Madeleine Bernard et al. [4] demonstrated, low-cost ICT applications in combating senior isolation not only reduce service costs but also enhance health outcomes, providing evidence that cost reduction through technology can support humanistic services and ensure sustainable industry development.

6. The role of policy and ecosystem building

Policies and ecosystem collaboration play a pivotal role in sustaining the balance between technology and humanism in elderly care entrepreneurship, as they provide the structural support and collaborative frameworks necessary to scale innovative solutions. For instance, China's recent enactment of the International Standard for Elderly Care Robots sets clear guidelines for device safety, data encryption, and ethical AI use, ensuring that technological tools do not compromise elderly users' privacy or autonomy [5]. Similarly, the European Union's General Data Protection Regulation (GDPR) has been adapted to elderly care contexts, mandating transparent data collection practices and giving older adults control over their health information, which aligns with the humanistic principle of dignity [6]. Beyond regulation, incentive-based policies are critical to encouraging human-centric innovation. Fiscal incentives, including tax deductions for eldercare providers incorporating intangible cultural heritage elements into service delivery models, demonstrate efficacy in aligning commercial operations with psychosocial wellbeing objectives while maintaining technological capabilities. Subsidies for R&D in age-friendly technologies, as seen in Shanghai's Elderly Care Technology Industrial Park, further lower the barrier for startups to develop solutions that balance efficiency and empathy [7].

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7. Conclusion

This study focuses on exploring the innovation of the "science and technology-humanism" balance model in technology-driven elderly care entrepreneurship, with business model innovation as the core and the Business Model Canvas (BMC) as the theoretical framework. Through qualitative analysis of Taikang HomeYanyuan, the e-VITA project, and the “Nanyang Tech” startup, three findings emerge: (1) Humanistic embedding—the systematic incorporation of emotional, cultural, and participatory dimensions—proves essential for addressing both instrumental and psychosocial needs; (2) Core competitiveness derives from reconceptualizing elderly users as holistic beings rather than care recipients; (3) Business model innovation serves as the critical mediator between technological capabilities and humanistic outcomes. The study’s limitations include constrained case diversity and predominant qualitative methodology, which may affect generalizability. Future research should: (1) adopt mixed-methods designs across differentiated care scenarios, (2) examine intergenerational demand variations, and (3) incorporate emerging gerontechnologies and policy ecosystem dynamics.

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