

Smart Integration and Experience Innovation in Senior Living Tourism: Digital Transformation Paths for Dalian's Aging Industry

Junjie Zhu, Fangbo Luo, Hongyu Li, Yingshu Shi*

School of Management, Liaoning University of International Business and Economics, Dalian, Liaoning, 116052, China

ABSTRACT

The intersection between rapid technological advancement and global population aging has created a new paradigm for the development of aging services. In China, where the number of older adults has exceeded 280 million, digital transformation is increasingly recognized as a key driver of innovation in the aging industry. This paper explores how the integration of smart technologies and experience innovation can enhance the quality, inclusiveness, and sustainability of senior living tourism. Dalian, a coastal city in northeastern China, provides a representative case for analyzing how digital platforms, intelligent data systems, and immersive cultural experiences can reshape traditional wellness tourism into a human-centered ecosystem. Drawing on international practices from Japan, Germany, and Finland, this study identifies three major development paths: the establishment of integrated intelligent service platforms, the personalization of wellness and lifestyle management, and the creation of interactive and emotionally engaging community experiences. A Smart Aging Tourism Integration Framework is proposed to align technology, service design, and social participation, offering practical insights for policymakers and industry practitioners who seek sustainable innovation in the emerging silver economy.

KEYWORDS

Smart aging; Digital transformation; Dalian; Senior living tourism; Experience innovation; Wellness technology

1 Introduction

The integration of digital technology into the aging industry has fundamentally transformed how societies conceptualize and deliver services for older adults ^[1]. As global populations live longer, the need for innovative, sustainable, and socially inclusive models of aging has grown increasingly urgent. The digital revolution, driven by artificial intelligence, big data, and connected devices, is reshaping the boundaries between healthcare, lifestyle, and leisure ^[2]. This transformation is particularly significant for the elderly population, for whom digital innovation provides not only health management tools but also new ways to connect, learn, and participate in community life ^[3]. China has been actively promoting technological solutions within its aging policies ^[4].

National strategies such as the "Healthy China 2030" plan and the "Internet Plus Elderly Care" initiative emphasize digital innovation as a key driver of social welfare reform. The concept of smart aging underscores that technology should complement rather than replace human care, fostering independence, empowerment, and dignity in later life. Within this broader transformation, senior living tourism has become a unique testing ground where health, leisure, and mobility converge ^[5]. Dalian, known for its coastal beauty, high-quality healthcare, and robust tourism sector, has emerged as a leading site for exploring how digital technologies can enhance elderly well-being ^[6]. However, many of its aging-related services still rely on traditional models, characterized by limited connectivity, standardized offerings, and insufficient interaction. This study aims to examine how Dalian can integrate digital technologies and experience innovation into its senior living tourism system, transforming it into a comprehensive ecosystem that promotes wellness, inclusion, and sustainable growth.

2 Literature Review and Theoretical Framework

2.1 Digital Transformation in the Aging Industry

Digital transformation refers to the integration of digital tools and platforms into all aspects of organizational and service delivery processes. In the aging sector, it encompasses digital health monitoring, telemedicine, intelligent homes, and smart community management. These technologies allow for real-time data collection, continuous feedback, and personalized care, thereby enhancing efficiency and user satisfaction ^[7].

Countries such as Finland and Japan have taken the lead in this area. Finland's "Digital Health Village" connects hospitals, wellness centers, and community organizations through a national digital platform that offers preventive health services and remote consultations. Japan's Atami City has integrated sensor-based safety monitoring with hospitality and wellness services, demonstrating that technology can enhance both security and enjoyment for elderly residents. These cases highlight the value of interoperability, ethical data management, and user-friendly design in building smart aging systems.

* **Corresponding Author:** Yingshu Shi, aliceshiyingshu@gmail.com

2.2 The Experience Economy, Smart Tourism, and Wellness

The experience economy emphasizes that consumers seek meaningful and memorable experiences rather than merely functional products. Within the aging sector, this means that older adults desire services that engage them intellectually, emotionally, and socially. Smart tourism applies technology to create interactive environments, allowing visitors to customize their experiences in real time ^[8]. When combined with wellness-oriented living, smart tourism transforms aging from a stage of dependency to one of exploration and growth.

Wellness tourism literature suggests that experiential design increases satisfaction and long-term engagement. By merging digital interactivity with cultural and natural heritage, destinations can create environments where seniors participate as co-creators of experience. Virtual reality, augmented reality, and artificial intelligence can deepen engagement, facilitate accessibility, and personalize wellness routines. These technologies are most effective when embedded within inclusive design principles that prioritize usability and emotional connection.

2.3 Smart Aging and Experience Innovation: Recent Research Trends

Recent academic discussions emphasize that smart aging should not focus solely on technological novelty but on the integration of human experience and social value. Studies in gerontechnology highlight that the effectiveness of smart systems depends on users' sense of trust, autonomy, and cultural relevance. For instance, European models of "compassionate technology" argue that digital transformation must align with social ethics and local culture. Similarly, research from East Asia emphasizes the importance of collectivism and community belonging in technology adoption among seniors ^[9]. In the context of senior living tourism, experience innovation becomes both a design philosophy and a service strategy. It requires multidisciplinary collaboration between technology developers, healthcare professionals, designers, and sociologists. The current research gap lies in how to operationalize these concepts within specific regional settings such as Dalian. This study aims to bridge that gap by combining theoretical insights from smart aging with empirical evidence from wellness tourism and experience design.

3 The Case of Dalian: Background and Current Situation

3.1 City Profile and Development Context

Dalian is a medium-sized coastal metropolis located at the southern tip of Liaoning Province. Its natural advantages include a temperate climate, abundant marine resources, and a long coastline suitable for recreational and therapeutic activities. The city has a strong medical foundation with several tertiary hospitals and rehabilitation institutions. It also boasts a thriving tourism industry supported by modern transportation networks and international recognition as a "City of Health and Longevity." As of 2023, Dalian's population over sixty accounted for approximately one-quarter of its residents ^[10]. This demographic structure has prompted the government to view aging services not as a burden but as a new economic opportunity. The city's wellness and elderly tourism programs have been incorporated into its "14th Five-Year Plan," with an emphasis on combining technology, healthcare, and culture. Despite these advances, most initiatives remain fragmented and lack a unified strategy for smart integration.

3.2 Current State of Digital Applications

Digital technology use in Dalian's aging sector is expanding but uneven. Hospitals have begun using telemedicine platforms, and some wellness resorts offer online reservation and remote consultation systems ^[11]. Several communities have experimented with wearable health monitoring devices that track sleep, exercise, and heart rate. Nonetheless, these applications are often isolated pilot projects rather than components of an interconnected system. Data-sharing agreements between medical and tourism institutions remain rare. Many elderly residents have expressed both curiosity and anxiety about smart services. Some appreciate their convenience, while others struggle with digital literacy or fear of privacy breaches ^[12]. This situation underscores the need for education programs, clear regulations, and inclusive design to ensure that digital transformation benefits all demographic groups equally.

4 Smart Integration and Experience Innovation Pathways

4.1 Building an Integrated Smart Service Platform

The foundation of digital transformation lies in the development of a comprehensive smart platform that integrates healthcare, accommodation, mobility, and recreation. Dalian can construct a digital ecosystem where seniors can manage their wellness programs, consult healthcare professionals, and participate in cultural activities through a single application. This platform should be jointly managed by government agencies, private enterprises, and community organizations. Public institutions can ensure data protection and ethical oversight, while companies contribute technological expertise and innovation capacity. Artificial intelligence can analyze data trends, forecast service demand, and recommend individualized programs. Over time, this system can evolve into a city-level database that supports continuous learning and improvement across the wellness and tourism industries ^[13].

4.2 Personalizing Health and Lifestyle Management

Personalization is central to smart aging. Wearable sensors and mobile applications can track individual health metrics and provide real-time feedback ^[14]. Based on these indicators, Dalian's wellness centers can design tailored programs that combine physical therapy, nutritional guidance, and recreational activities. Seniors could also receive digital alerts for preventive care, reducing medical risks and increasing autonomy.

Beyond physical health, personalization should encompass emotional and cultural dimensions. Smart systems can suggest activities such as art therapy, coastal hiking, or cultural heritage workshops that match an individual's interests and physical condition. This integration of technology with lifestyle design encourages older adults to remain active participants in society, reinforcing their sense of purpose and belonging ^[15].

4.3 Creating Immersive and Interactive Experiences

Experience innovation transforms tourism and wellness from passive consumption into participatory engagement. Virtual reality technology can recreate historical scenes or underwater ecosystems, offering seniors educational and therapeutic benefits. Interactive storytelling platforms can allow them to share memories, document personal histories, and connect with younger generations. Smart community spaces equipped with digital installations and responsive environments can promote social interaction. For instance, interactive screens can display personalized wellness goals, while intelligent lighting systems can adjust based on circadian rhythms to improve sleep quality ^[16]. These innovations turn everyday activities into experiences that are both enjoyable and health-enhancing.

4.4 Ensuring Accessibility and Digital Inclusion

Technological progress must be accompanied by social inclusion. Dalian can establish digital education programs in community centers to improve seniors' technological literacy. These programs should be participatory and emphasize confidence-building rather than technical jargon. Simplified user interfaces, large-print options, and voice-command functions can make devices accessible to users with sensory limitations ^[17]. Public-private partnerships can provide subsidized access to internet connections and affordable smart devices. By embedding accessibility into policy and design, Dalian can ensure that no group is excluded from digital transformation.

5 Discussion

The digital transformation of senior living tourism represents a broader rethinking of aging as a social and cultural experience rather than a purely biological process. By connecting technology, wellness, and cultural participation, Dalian can pioneer a model of aging that emphasizes empowerment and creativity.

International experience reinforces this potential. Finland's Health Village demonstrates that trust, ethical governance, and interoperability are essential for long-term success. Japan's Atami City shows how technology can complement traditional wellness industries without eroding their human touch. Germany's Baden-Baden illustrates the value of preserving cultural authenticity while integrating digital health systems. Dalian can adapt these lessons by prioritizing both efficiency and empathy in its digital innovation.

Ethical governance remains a central issue. As data collection becomes pervasive, privacy and informed consent must be carefully protected. Transparent data policies, third-party audits, and accessible communication about data use can increase trust among users. Artificial intelligence applications must be designed to enhance fairness and avoid algorithmic bias that could disadvantage vulnerable groups ^[18]. Moreover, environmental sustainability should be considered in the development of digital infrastructure to ensure that technological progress aligns with ecological responsibility. Another emerging topic is cultural sensitivity in technology adoption. In Chinese society, the concept of filial piety and collective harmony influences how seniors perceive digital care. Developers should integrate cultural values into system design, such as incorporating family interaction features or community-based decision-making processes. A culturally adaptive approach ensures that smart aging technologies are accepted and utilized effectively.

Finally, the role of education cannot be overstated. Continuous training for service professionals, including digital health managers, gerontologists, and hospitality staff, is vital for sustaining innovation. Interdisciplinary collaboration between universities, technology firms, and public institutions will generate the knowledge base required for sustainable development.

6 Conclusion

Dalian is at the forefront of a transformation that connects the digital economy with the aging society. The integration of technology and experience innovation offers the potential to redefine senior living tourism as a holistic, inclusive, and emotionally enriching system. Through intelligent service platforms, personalized wellness programs, immersive experiences, and strong ethical governance, the city can set a benchmark for sustainable smart aging ^[19].

The successful realization of this vision will depend on long-term collaboration among government agencies, private enterprises, academic institutions, and civil society. Investment in infrastructure, workforce training, and public awareness

campaigns will create an enabling environment for innovation. Future research should continue exploring the interaction between technology and culture, focusing on user-centered design and cross-generational engagement.

Dalian's approach can contribute to international understanding by offering a model of balanced development that respects both technological progress and human dignity. In a world where population aging is becoming a universal reality, smart integration provides a pathway toward resilient and compassionate societies. Aging in the digital era should be viewed not as a challenge but as an opportunity to enhance connection, meaning, and collective well-being^[20]. The city's ongoing innovation demonstrates that with vision and cooperation, technology can serve humanity's most fundamental aspiration: to live not only longer but also better.

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About the Author

Junjie Zhu, 2004. Gender: Female, Ethnicity: Han, Affiliation: Liaoning University of International Business and Economics. Research Focus: Elderly Care Service Management, Academic Degree: Bachelor's Degree.

Yingshu Shi, born in January 1992, female, ethnicity: Han, affiliation: Liaoning University of International Business and Economics, academic degree: PhD candidate.

References

- [1] Schulz R, Wahl H W, Matthews J T, et al. Advancing the aging and technology agenda in gerontology[J]. *The gerontologist*, 2015, 55(5): 724-734.
- [2] Cognitive hyperconnected digital transformation: Internet of things intelligence evolution[M]. CRC Press, 2022.
- [3] Bhavnani S P, Parakh K, Atreja A, et al. 2017 Roadmap for innovation—ACC health policy statement on healthcare transformation in the era of digital health, big data, and precision health: a report of the American College of Cardiology Task Force on Health Policy Statements and Systems of Care[J]. *Journal of the American College of Cardiology*, 2017, 70(21): 2696-2718.
- [4] Hung J. Smart elderly care services in China: challenges, progress, and policy development[J]. *Sustainability*, 2022, 15(1): 178.
- [5] Lehto X Y, Mohamed M E, Chen J, et al. Seniors, Technology, and Travel: A Review, Reappraisal, and Future Research Directions[J]. *Journal of Travel Research*, 2025: 00472875251383534.
- [6] Zhou B, Deng Q, Zhou S, et al. Health care in future community: innovatively discover and respond to the needs of today's seniors[J]. *Frontiers in Public Health*, 2023, 11: 1302493.
- [7] Alam M M, Malik H, Khan M I, et al. A survey on the roles of communication technologies in IoT-based personalized healthcare applications[J]. *IEEE access*, 2018, 6: 36611-36631.
- [8] Zhang Y, Sotiriadis M, Shen S. Investigating the impact of smart tourism technologies on tourists' experiences[J]. *Sustainability*, 2022, 14(5): 3048.
- [9] North M S, Fiske S T. Modern attitudes toward older adults in the aging world: a cross-cultural meta-analysis[J]. *Psychological bulletin*, 2015, 141(5): 993.
- [10] Wang Z, Du Z, Guo F, et al. High-Temperature Risk Assessment and Adaptive Strategy in Dalian Based on Refined Population Prediction Method[J]. *Sustainability*, 2025, 17(17): 7985.
- [11] MARTINELLI S, BASTIANELLI L. The rise of multi-sided platforms in healthcare: insights from telemedicine companies[J]. 2021.
- [12] Park Y J. Digital literacy and privacy behavior online[J]. *Communication research*, 2013, 40(2): 215-236.
- [13] Cheung S M, Zheng W Q, Wang X. Developing age-friendly spaces through a gerontechnological lens: a systemic framework based on FDM-DANP analysis[J]. *Frontiers in Medicine*, 2025, 12: 1681486.
- [14] Wan J, AAH Al-awlaqi M, Li M S, et al. Wearable IoT enabled real-time health monitoring system[J]. *EURASIP Journal on Wireless Communications and Networking*, 2018, 2018(1): 1-10.
- [15] Andonian L, MacRae A. Well older adults within an urban context: Strategies to create and maintain social participation[J]. *British Journal of Occupational Therapy*, 2011, 74(1): 2-11.
- [16] Papatsimpa C, Linnartz J P. Personalized office lighting for circadian health and improved sleep[J]. *Sensors*, 2020, 20(16): 4569.
- [17] Shoaib M, Fitzpatrick D, Pitt I. Assistive technology-based solutions in learning mathematics for visually-impaired people: exploring issues, challenges and opportunities[J]. *Multimedia Tools and Applications*, 2023, 82(29): 46153-46184.
- [18] Min A. ARTIFICIAL Intelligence And Bias: Challenges, Implications, And Remedies[J]. *Journal of Social Research*, 2023, 2(11).
- [19] Lifelo Z, Ding J, Ning H, et al. Artificial intelligence-enabled metaverse for sustainable smart cities: Technologies, applications, challenges, and future directions[J]. *Electronics*, 2024, 13(24): 4874.
- [20] Chan M. Digital communications and psychological well-being across the life span: Examining the intervening roles of social capital and civic engagement[J]. *Telematics and Informatics*, 2018, 35(6): 1744-1754.