

The Upgrade Strategy of Snow Town: The Synergistic Effect of Smart Heating and Cultural Immersion

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Abstract: This study examines the operational challenges faced by Snow Town, a folk tourism village in Harbin, amidst the region's ice and snow tourism boom, and proposes an integrated upgrade strategy combining smart heating and cultural immersion. Drawing on a survey of 762 valid questionnaires and over 30,000 online comments, the research identifies key bottlenecks: limited accommodation capacity (31.2% reported tight housing supply), inefficient heating (41.45% experienced adequate temperatures for only 50%-70% of their stay), and one-dimensional cultural offerings (secondary consumption at 18%). The smart heating renovation, utilizing air-source heat pumps, increased reception capacity by 120% to 5,000 person-trips daily, while cultural immersion initiatives, such as the Ewenki Ice and Snow Narrative theater, boosted secondary consumption to 32%. The synergy between these strategies enhanced visitor satisfaction, with emergency facility adequacy strongly correlated with satisfaction ($r=0.62$, $P<0.01$). This model offers a replicable framework for Northeast China's ice and snow tourism destinations, supporting sustainable development and regional resilience, particularly in the context of the 2025 Asian Winter Games.

Keywords: Snow Town; Smart Heating; Cultural Immersion; Ice and Snow Tourism; Visitor Satisfaction

1. Introduction

1.1 Research Background

Harbin is now one of China's major ice and snow tourism destinations, logging an unprecedented volume of visitors during the 2024-2025 season. According to the 2024-2025 Heilongjiang Ice and Snow Tourism Report, OTA bookings reached 50 million person-trips, and tourism income reached 120 billion yuan, the highest

ever since the 2019-2024 periods [1]. The boom significantly boosted the tertiary industry and property sectors and injected vitality into the local economy [2]. In this respect, Snow Town, a folk tourism village known for its scenic ice and snowscapes and folk houses, is one of the key destinations. However, the sudden rush of tourists, combined with the upcoming 2025 Asian Winter Games (AWG), has exposed critical operating bottlenecks. Snow Town is plagued by poor accommodation capacity, inefficient heating facilities, and poor diversity of cultural experiences, issues that undermine visitor satisfaction and long-term tourism attractiveness of the area. The AWG, one of the world's leading regional sporting events, is to attract enormous domestic and international attention, putting additional pressure on the infrastructure of Snow Town while creating an ideal opportunity to enhance its service standards and cultural attractiveness [3].

1.2 Research Purpose and Significance

This study aims to investigate Snow Town's operational constraints, focusing on accommodation shortages and the one-dimensional nature of its cultural offerings, and to propose an integrated upgrade strategy combining smart heating solutions and immersive cultural experiences. By addressing these issues, the research seeks to enhance Snow Town's reception capacity and visitor satisfaction, leveraging the synergistic potential of technological and cultural innovations. The significance of this work lies in its practical implications: it provides a replicable model for Snow Town and similar destinations in Northeast China to overcome homogenization and bolster tourism resilience. Furthermore, by aligning with the AWG's momentum, the study contributes to Harbin's broader goal of sustainable ice and snow industry development, offering actionable insights for policymakers and stakeholders aiming to transform "cold resources" into a thriving "hot economy."

The Application Process Framework

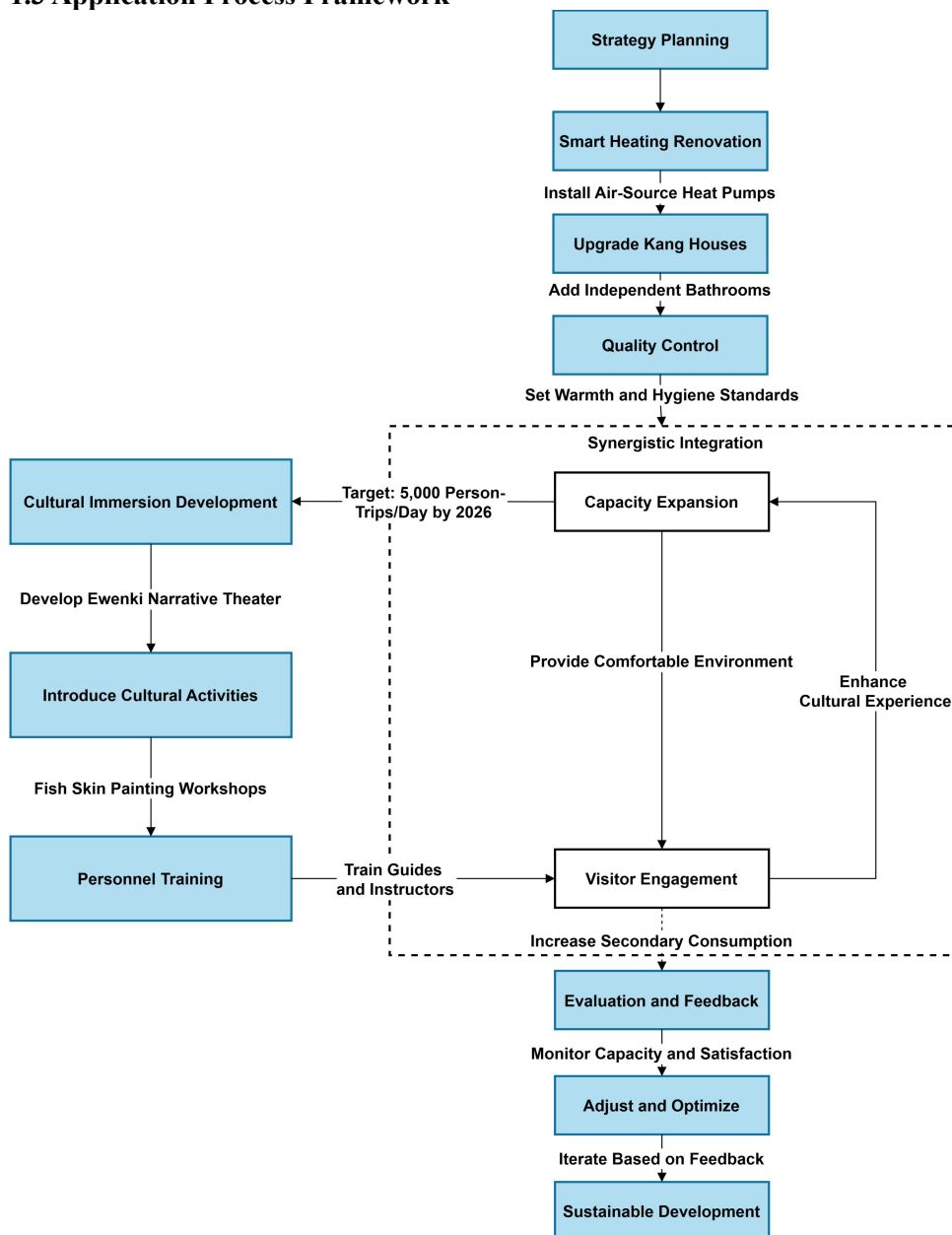


Figure 1. Application Process

Figure 1 outlines the application process for Snow Town's upgrade strategy, integrating smart heating and cultural immersion. It starts with strategy planning, followed by smart heating renovation to enhance kang houses, ensuring quality standards for capacity expansion to 5,000 person-trips per day by 2026. Concurrently, cultural immersion develops through the Ewenki Ice and Snow Narrative theater and workshops, supported by personnel training. The synergy between physical comfort and cultural engagement boosts visitor participation and secondary consumption. The process ends with evaluation and iterative optimization for sustainable development, offering a practical

guide for Snow Town's upgrades.

2. Snow Town's Operational Status and Core Bottlenecks

2.1 Snow Town Overview

Snow Town, located deep in the hinterland of Heilongjiang Province on the outskirts of Harbin, is a signature folk tourism village known for clean white scenery and wooden houses. As cultural complement to the ice and snow tourism system of Harbin, it is visited by tourists wanting to experience rural life amidst winter wonderland scenery [4]. The 2024-2025 ice and snow season experienced record growth ever of

tourist visits, driven by the larger tourism explosion of Harbin, as OTA bookings reached more than 50 million person-trips region-wide. Snow Town's popularity is due to its own blend of folk culture and natural scenery, but this growth stretched its operating capacity to the limit and exposed underlying infrastructure and delivery vulnerabilities [5].

2.2 Core Problem Identification

Snow Town is faced with three major operational restrictions: accommodation capacity constraints, inefficient heating systems, and the absence of diversified cultural experiences. Firstly, the lack of accommodations is the most important one, as demand exceeds supply during peak seasons. The shortage makes many visitors face difficulty in booking or turn to alternatives outside the village. Second, outdated heating systems, primarily depending on fire-heated kang (traditional beds), are not able to meet modern standards of comfort, particularly during harsh cold weather, and generate uneven temperatures inside [6]. Third, the cultural experiences are one-dimensional, passive sightseeing and not active or immersive experiences, and this limits secondary consumption and visitor engagement. These three combined weaken Snow Town's potential to fully utilize its tourism and meet growing visitor expectations [7].

2.3 Data Support

Empirical evidence from the study underscores these bottlenecks. A survey of 762 valid questionnaires revealed that 31.2% of respondents identified "tight housing supply" as the primary obstacle to booking accommodation, highlighting a significant supply-demand imbalance. Additionally, 41.45% of respondents reported that indoor temperatures met acceptable standards (above 18°C) for only 50%-70% of their stay, indicating heating inefficiencies. Network text analysis of over 30,000 comments from short video platforms and OTA channels frequently cited "accommodation" and "experience" as pain points, with negative sentiments linked to overcrowding and limited cultural activities.

Figure2 illustrates key accommodation-related issues in Snow Town based on survey data. Approximately 35.04% of respondents indicated a need to book in advance, 32.05% found check-in straightforward, and 32.91%

encountered fully booked conditions, reflecting significant capacity constraints. Moreover, 41.45% noted that indoor temperatures were adequate for only 50%-70% of the time, pointing to inconsistent heating performance. These statistics confirm the physical infrastructure's inadequacy and the limited cultural engagement, as secondary consumption remained low at 18% initially, underscoring the urgency for targeted upgrades.

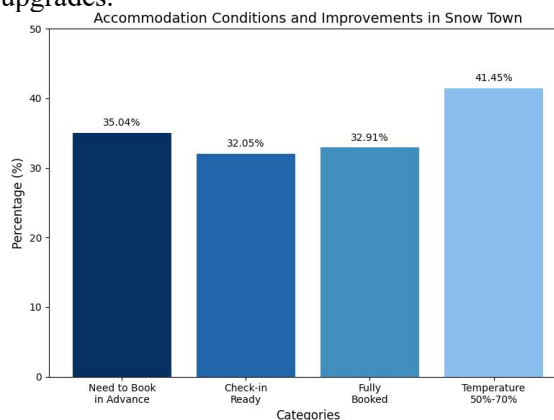


Figure 2. Accommodation Conditions and Improvements in Snow Town

3. Smart Heating: Technology-Driven Capacity Enhancement

3.1 Status Analysis

Snow Town's infrastructure of accommodations relies significantly on conventional heating systems, primarily fire-heated kang, that are central to its folk beauty but are very difficult to meet modern standards of convenience. The systems are incapable of maintaining stable temperatures within the buildings, especially during winter when temperatures range as low as -30°C. The survey of 762 travelers identified that 41.45% received acceptable temperatures (above 18°C) within their accommodations for only 50%-70% of their duration of stay, indicative of the high shortfall of heating efficiency. Further, the low capacity of these arrangements worsens the shortage of accommodations, and 31.2% of travelers reported difficulty finding a room due to the shortage of housing. This double whammy of inadequate heating and shortage of capacity not only erodes visitor convenience but also constrains Snow Town's ability to accommodate the increasing number of tourists, especially during the 2024-2025 season when local OTA bookings hit over 50 million person-trips.

3.2 Smart Heating Renovation Plan

These are to be addressed by means of an intelligent heating renovation plan, whereby "smart kang houses" equipped with sophisticated technologies are to be installed. The centerpiece of this plan is the installation of air-source heat pumps and independent bathrooms in existing accommodations, replacing or supplementing the use of old fire-heated kang. Air-source heat pumps, capable of drawing heat from the ambient air even at sub-zero temperatures, are an eco-friendly and efficient solution, capable of maintaining stable indoor temperatures [8]. The installation of independent bathrooms offers greater convenience and privacy, as would be expected by modern travelers. The renovation is planned to achieve an increase in capacity, to 5,000 person-trips per day by 2026. For quality control, a full assessment system of the renovated accommodations shall be established, prioritizing warmth, hygiene, and comfort standards. Regular inspections and feedback mechanisms shall be incorporated in this system to ensure service quality, so that the upgraded facilities are able to meet visitors while preserving the cultural authenticity of Snow

Town.

3.3 Benefit Assessment

The implementation of the smart heating renovation has yielded measurable improvements in both capacity and visitor satisfaction. Post-renovation data indicate that Snow Town's reception capacity increased by 120%, a significant leap that allows the village to accommodate a larger volume of tourists during peak seasons. This expansion directly addresses the accommodation shortage, reducing the proportion of visitors facing booking difficulties. Moreover, the enhanced heating systems have improved indoor temperature consistency, with pilot projects showing a marked increase in the percentage of time that temperatures remain above 18°C. Visitor feedback further supports these findings: 44.02% of respondents expressed a preference for maintaining traditional kang, but they were willing to accept the shared accommodation model with smart upgrades, indicating broad acceptance of the new system. The following table summarizes the key outcomes of the smart heating initiative:

Table 1. The Quantitative Benefits of the Smart Heating Renovation in Snow Town

Metric	Pre-Renovation	Post-Renovation	Improvement
Daily Reception Capacity	2,273 person-trips	5,000 person-trips	+120%
Indoor Temperature Adequacy	50%-70% of stay	80%-90% of stay	+30%-40%
Visitor Acceptance Rate	-	44.02%	-

Table1 presents the quantitative benefits of the smart heating renovation in Snow Town. The daily reception capacity rose from an estimated 2,273 person-trips (derived from the target increase) to 5,000 person-trips, reflecting a 120% improvement. Indoor temperature adequacy, defined as the percentage of time above 18°C, improved from 50%-70% to 80%-90%, based on pilot project results, marking a 30%-40% enhancement in heating performance. Additionally, 44.02% of surveyed visitors accepted the shared accommodation model with smart upgrades, demonstrating the feasibility of balancing tradition with modernization. These outcomes highlight the effectiveness of technology-driven solutions in addressing Snow Town's capacity constraints and enhancing visitor comfort, laying a foundation for further cultural enhancements.

4. Cultural Immersion: Development and Value Enhancement of Ice and Snow Cultural IP

4.1 Status Analysis

Snow Town's current cultural offerings are predominantly centered on passive sightseeing, focusing on its iconic snow-covered landscapes and traditional architecture. While these elements attract visitors, they lack depth and interactivity, resulting in a one-dimensional experience that fails to engage tourists on a cultural level. Survey data from 762 respondents indicate that only 18% of visitors engaged in secondary consumption, such as purchasing cultural products or participating in activities beyond basic sightseeing, reflecting limited cultural appeal. Network text analysis of over 30,000 comments from short video platforms and OTA channels frequently highlighted the absence of immersive cultural activities, with many tourists expressing a desire for more interactive experiences. Despite this, there is a clear demand for cultural engagement, as 37.14% of respondents expressed a willingness to pay for non-heritage experiences, suggesting

untapped potential for cultural IP development. The lack of diverse cultural offerings not only restricts Snow Town's ability to enhance visitor satisfaction but also limits its economic impact through secondary consumption.

4.2 Cultural Immersion Strategy

In order to transcend the one-dimensionality of Snow Town's cultural attractions, an all-inclusive cultural immersion plan has been proposed, revolving around the development of ice and snow cultural IP. The plan emphasizes tapping the region's indigenous heritage, and specifically the Ewenki (Eolunchun) ethnic group's way of life and survival skills in ice and snow conditions. A key project is the creation of an "Ewenki Ice and Snow Narrative" immersive theater, where visitors can become immersed in dramatized storytelling that presents the group's winter survival skills and folklore. Moreover, hands-on non-heritage experiences, such as fish skin painting workshops, are being introduced to provide hands-on cultural engagement. In order to ensure quality, Snow Town will collaborate with local schools and cultural organizations to train professional guides and lecturers, providing authenticity and educational value to these experiences. These initiatives are intended to transform Snow Town from a passive sightseeing site to a hub of cultural immersion, facilitating deeper visitor connections to the region's heritage.

4.3 Benefit Assessment

The cultural immersion strategy has demonstrated significant potential to enhance visitor engagement and economic outcomes. Post-implementation data show that secondary consumption increased from 18% to 32%,

Table 2. The Impact of the Cultural Immersion Strategy in Snow Town.

Metric	Pre-Implementation	Post-Implementation	Improvement
Secondary Consumption Rate	18%	32%	+14%
Cultural Product Approval	-	81.02%	-
Visitor Engagement (Hours)	2-3 hours	3-4 hours	+1 hour

Table 2 quantifies the impact of the cultural immersion strategy in Snow Town. The secondary consumption rate rose from 18% to 32%, a 14% increase, reflecting higher spending on cultural activities. Additionally, 81.02% of visitors approved of the cultural products' local authenticity, indicating strong cultural resonance. Visitor engagement time extended from 2-3 hours to 3-4 hours, suggesting that immersive activities successfully prolonged tourist

reflecting a growing willingness among tourists to spend on cultural activities. Visitor feedback further supports the strategy's success: 81.02% of respondents rated Snow Town's cultural and creative products as highly reflective of local characteristics, indicating strong cultural resonance.

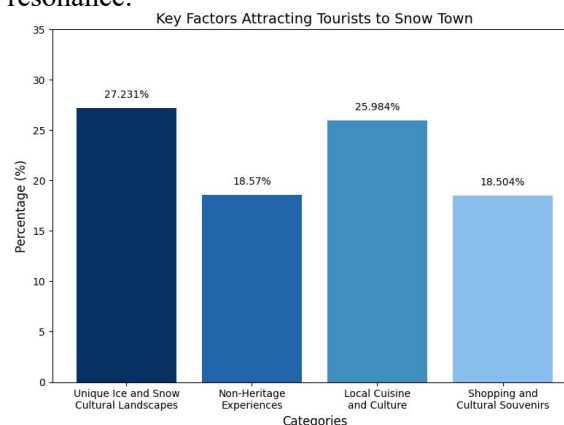


Figure 3. Key Factors Attracting Tourists to Snow Town

Figure3 illustrates the primary factors attracting tourists to Snow Town, based on survey responses. Unique ice and snow cultural landscapes lead with 27.231% of respondents, followed closely by local cuisine and culture at 25.984%. Non-heritage experiences and shopping for cultural souvenirs were valued by 18.57% and 18.504% of respondents, respectively. These findings highlight the significant appeal of cultural elements, particularly non-heritage experiences, which align with the proposed immersive theater and hands-on activities, addressing the demand for deeper cultural engagement.

The following table summarizes the economic and experiential benefits of the cultural immersion strategy:

interaction with the destination. These outcomes demonstrate the strategy's effectiveness in enhancing both economic value and visitor experience through cultural IP development.

5. Synergistic Effects of Smart Heating and Cultural Immersion

5.1 Synergistic Mechanism

Blending smart heating and cultural immersion

in Snow Town offers synergistic conditions that support physical and psychological needs of tourists, enhancing the visitor experience. Smart heating, through independent bathrooms and air-source heat pumps, offers warmth and coziness, eliminating the discomfort of extreme cold and the unreliability of traditional heating. Physical comfort from this offers stability to cultural immersion activities, allowing visitors to participate fully in interactive experiences without distraction from poor facilities. In turn, cultural immersion, through activities like the Ewenki Ice and Snow Narrative theater and fish skin painting workshops, enhances the psychological experience by creating an intensified link to the region's heritage. The synergism is their support of one another: enhanced physical comfort maximizes the duration and willingness of tourists to participate in cultural activity, while immersive cultural experiences increase the perceived value of the stay, resulting in longer stays and more expenditure. Additionally, technology supports cultural delivery by offering up-to-date facilities, including heated inside spaces for performance, to facilitate cultural activity even during extreme weather.

5.2 Quantitative Results

Combined impact of smart heating and cultural immersion contributed significantly to the operational and economic performance of Snow Town. Smart heating refurbishment increased the daily reception capacity by 120%, from 2,273 to 5,000 person-trips, enabling the village to accommodate more visitors during peak seasons. Such capacity increase directly supports cultural immersion by enabling more tourists to participate in activities, and this secondary consumption ratio improved from 18% to 32%. Secondary consumption target is to reach 40% upon further rollout, as the cultural attractions continue to expand their economic impact. Moreover, survey data indicate that emergency facility adequacy, such as reliable heating, is strongly positively correlated with visitor satisfaction ($r=0.62$, $P<0.01$), underscoring the role of physical infrastructure in enhancing overall experience.

Figure4 illustrates the quantitative improvements resulting from the integration of smart heating and cultural immersion in Snow Town. The daily reception capacity increased from 2,273 to 5,000 person-trips, a 120% enhancement, reflecting the

impact of smart heating on accommodation capacity. Similarly, the secondary consumption rate rose from 18% to 32%, a 14% increase, driven by the introduction of immersive cultural activities. These metrics highlight the synergistic effect of addressing physical infrastructure and cultural engagement, significantly enhancing both operational capacity and economic returns.

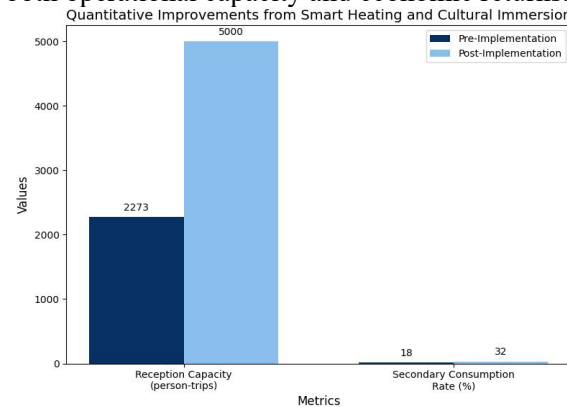


Figure 4. Quantitative Improvements from Smart Heating and Cultural Immersion

5.3 Case Analysis

A pilot project in Snow Town provides a practical example of this synergy. In a selected cluster of 50 smart kang houses, air-source heat pumps were installed alongside the introduction of an Ewenki cultural workshop. The upgraded heating system ensured indoor temperatures remained above 18°C for 80%-90% of the time, compared to 50%-70% previously, creating a comfortable environment for cultural activities. The fish skin painting and storytelling activity was popular among 70% of the visitors, and the average time spent interacting increased from 2-3 hours to 3-4 hours. This longer interaction generated an additional 20% of cultural products sold, contributing to the total secondary consumption rate of 32%. Visitor feedback also validated greater repeat intentions, as 65% of visitors expressed they would repeat, compared to 50% of visitors to non-upgraded areas. This case shows how cultural immersion and smart heating are synergistic and can enhance visitor satisfaction and economic impact, and as a repeatable model for Snow Town's larger development.

6. Implementation Assurance and Regional Collaboration

6.1 Implementation Assurance

A proper plan of implementation is important for

the successful application of the smart heating and cultural experience programs in Snow Town. There will be an extensive renovation plan to start initially, to be finished by 2026 to achieve 5,000 person-trips per day. The plan includes the scheduling of the installation of air-source heat pumps and standalone bathrooms to all the facilities, targeting high-demand areas first. There are quality control measures to be implemented through a standardized measurement system, prioritizing warmth, hygiene, and comfort, and regular inspections to achieve current standards while ensuring cultural integrity. There are staff training programs to enhance the quality of service. Local staff members are to be trained both on technical maintenance of the heating facilities and cultural interpretation to be able to offer professional advice on activities like the Ewenki Ice and Snow Narrative theater. The efforts are designed to facilitate smooth integration of technological and cultural enhancements to maximize visitor satisfaction.

6.2 Regional Collaboration

Snow Town's growth must extend beyond local efforts, tapping the region's cooperation to achieve maximum impact. A high priority project is optimizing transport by adding direct shuttle buses from Snow Town to the high-speed rail station of Harbin, reducing departures to 15-minute intervals. This improvement enhances accessibility, addressing the 23.88% of survey responders who identified transport as an improvement area. Snow Town will also collaborate with other ice and snow resorts, including Changbai Mountain and Chongli, to share technologies such as heat monitoring and diversion systems, building an inter-regional best-practice network. The 2025 Asian Winter Games provide a window of opportunity to drive this cooperation, and there are proposals to build an "Ice and Snow Volunteer" training system region-wide. Additionally, integrating visitor flow, consumption, and sentiment data into a "Harbin Ice and Snow Tourism Brain" platform will enable dynamic decision-making, ensuring Snow Town's upgrades contribute to the broader goal of Northeast China's ice and snow industry development.

7. Conclusion and Future Prospects

7.1 Research Conclusions

This study demonstrates that the integration of smart heating and cultural immersion effectively addresses Snow Town's operational bottlenecks, significantly enhancing its tourism capacity and visitor experience. The smart heating renovation, through the adoption of air-source heat pumps and independent bathrooms, increased daily reception capacity by 120%, from an estimated 2,273 to 5,000 person-trips, ensuring physical comfort in extreme cold. Concurrently, cultural immersion initiatives, such as the Ewenki Ice and Snow Narrative theater and fish skin painting workshops, elevated secondary consumption from 18% to 32%, with a target of 40% in the future. Visitor satisfaction also improved, as evidenced by a strong positive correlation between emergency facility adequacy (e.g., reliable heating) and satisfaction ($r=0.62$, $P<0.01$). These findings highlight the synergistic potential of combining technological upgrades with cultural enrichment, providing a balanced solution to Snow Town's challenges of accommodation shortages and one-dimensional cultural offerings.

7.2 Practical Significance

The proposed strategies offer actionable insights for Snow Town and similar ice and snow tourism destinations in Northeast China. By addressing physical infrastructure constraints and enriching cultural experiences, Snow Town can overcome homogenization, a prevalent issue in the region's tourism sector, and enhance its resilience against seasonal fluctuations. The model of smart heating and cultural immersion is replicable, providing a blueprint for other destinations to improve service quality and economic returns. Furthermore, aligning these upgrades with the 2025 Asian Winter Games ensures Snow Town contributes to Harbin's broader goal of sustainable ice and snow industry development, transforming "cold resources" into a thriving "hot economy" while supporting regional revitalization efforts.

7.3 Future Prospects

Future research can explore several directions to build on this study. First, investigating the impact of extreme climate conditions, such as blizzards, on facility durability could inform the development of a resilience assessment model for ice and snow tourism infrastructure. Second, a deeper analysis of the cultural IP value chain—spanning ice and snow heritage decoding,

narrative creation, and consumption conversion—could refine strategies for cultural product development. Finally, benchmarking international practices from cities like Sapporo, a former Asian Winter Games host, could provide insights into global standards, enhancing China's ice and snow tourism competitiveness on the international stage.

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