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Digital Transformation in Japan's Accommodation Sector - A Case Study of TAP Hospitality Lab Okinawa -

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Abstract

This study examines the potential of digital transformation (DX) in Japan's accommodation industry through a case study of TAP Hospitality Lab Okinawa (THL), an experimental facility established in 2023. THL exemplifies a modular and stakeholder-integrated approach, combining advanced technologies with multi-sector collaboration. Drawing on insights from an on-site investigation and SWOT analysis, the findings indicate that THL's innovations—including smart interfaces, contactless services, and robotic systems—significantly enhance operational efficiency and guest satisfaction. Beyond business innovation, THL advances a comprehensive model of tourism DX by contributing to regional revitalization in Okinawa, tourism development, and the cultivation of domestic and local IT talent. Despite certain constraints, the study positions THL as a viable and scalable testbed for accelerating DX adoption across Japan's hospitality sector.

Keywords: Accommodation industry, Labor productivity, DX, Public-private collaboration

1 Introduction

1.1 Research Background and Objectives

Promoting tourism remains a key strategy for Japan, especially in light of demographic challenges such as a declining and aging population. The "Basic Plan for Promoting a Tourism-Based Nation," approved by the Cabinet in March 2023, lists three strategies to be implemented by 2025 to create sustainable tourist destinations: "establishment of a regional development system," "recovery of inbound tourism," and "expansion of domestic exchanges" [1]. In particular, the main measures for "establishment of a regional development system" include "development and securing of tourism human resources," "digital tourism," and "high added value in the tourism industry," which shows how urgent it is to develop human resources to support the tourism sector and improve labor productivity (added value per employee).

The Japan Tourism Agency has pointed out that labor productivity in the accommodation industry is lower than the overall industry level [2], and has stated that the use of digital transformation (hereinafter referred to as "DX") is the key to improving productivity and adding high value in the tourism and accommodation market [3]. In Japanese government statistics, the accommodation industry often includes food and beverage services. Therefore, unless otherwise noted, the term "accommodation industry" in this article refers broadly to both sectors.

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According to the Japan Institute for Labor Policy and Training (2024), in the 2023 fiscal year, the average wage for all industries was 318,300 yen, while that of the accommodation industry (including food and beverage services) was only 259,500 yen [4]. Furthermore, Fujiyama (2022) points out that the annual wage in the accommodation industry is more than 1 million yen lower than the national average [5]. Kawashima (2023) characterizes the accommodation industry as a typical "labor-intensive industry" where human interaction and service provision account for the much of the added value [6]. In other words, it has a structural characteristic that tends to lead to high labor costs. However, if the current low wage level remains, it is unlikely that the chronic labor shortage in the industry will be resolved. If this problem is ignored, there is a possibility that the provision of stable services and the quality of services will decline, and the outflow of labor will accelerate, resulting in a vicious cycle. This is where DX comes in. Promoting DX in the hospitality industry is not only expected to improve efficiency across the industry, but will also be an important means of improving customer experience.

This study aims to consider the future direction of DX in the domestic accommodation industry by taking up "TAP Hospitality Lab" (hereinafter referred to as "THL"), which opened in Uruma city, Okinawa prefecture in June 2023, as an advanced example. THL is not a conventional commercial hotel but a purpose-built demonstration facility that allows real guest stays in a controlled environment. Its primary function is to serve as a living lab for testing and refining DX solutions tailored to the accommodation industry. Operated by TAP Co., Ltd. (hereinafter referred to as "TAP")—a long-standing IT solutions provider specializing in the hospitality industry—THL functions as a research and development site where emerging technologies can be observed, evaluated, and improved under real-world conditions. Founded in 1987, TAP has developed and commercialized a number of digital systems for accommodation providers, contributing significantly to productivity improvements and digital innovation in the sector.

The remainder of this paper is structured as follows: Section 2 reviews related literature. Section 3 outlines the research method. Section 4 presents the case study and SWOT analysis. Section 5 discusses the findings and concludes the study.

1.2 Research Question

How does THL's modular and stakeholder-integrated approach contribute to advancing digital transformation in Japan's hospitality industry?

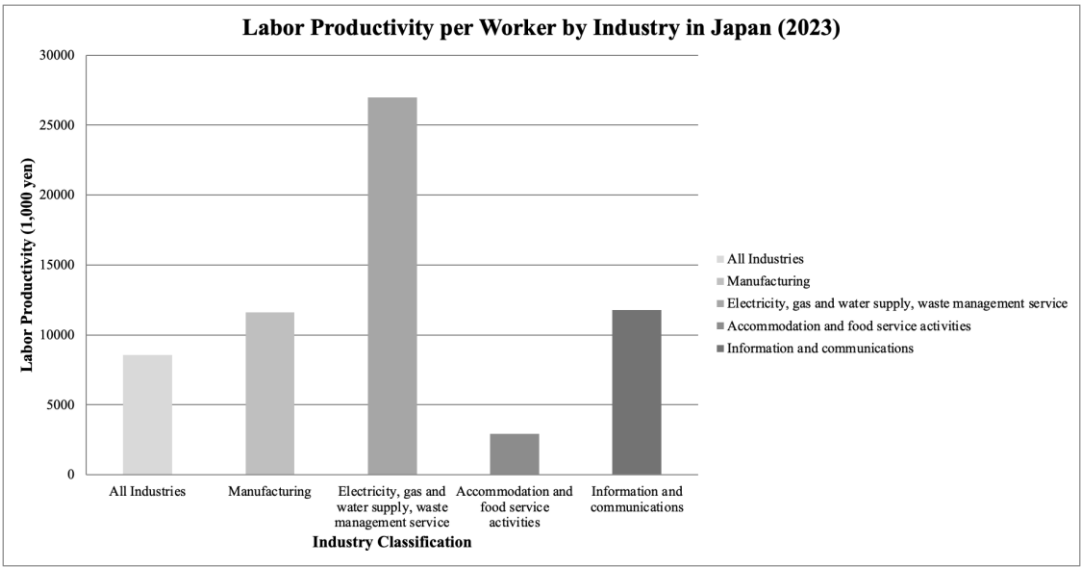
2 Literature Review

2.1 Labor Productivity in Japan's Accommodation Sector

This study applies service innovation theory, which explains how technology transforms service design, delivery, and user experience [7][8]. THL functions as a testbed for digitally enhanced hospitality services in Japan, fostering value co-creation among stakeholders. In addition, the study draws on Grönroos's Service Logic framework [9], which views customers as co-creators and providers as facilitators of value. THL exemplifies this by supporting interactive value creation through modular infrastructure, real-time feedback, and co-experiential service environments.

According to reports by the Ministry of Economy, Trade and Industry and the Cabinet Office, Japan's service sector continues to have comparatively low productivity levels among OECD countries, particularly within the accommodation industry [10][11]. Key factors contributing to these low productivity levels include structural issues, such as the predominance of small, independently operated businesses and delays in adopting Information and Communication Technology (hereinafter referred to as "ICT") [10][11]. As a consequence of these factors, productivity in Japan's accommodation industry is significantly lower compared to the United States. For instance, labor productivity in Japan is only about 26.5% of the U.S. level [12]. While broader productivity indicators such as total factor productivity (TFP) also exist, this study focuses on labor productivity, which is more directly linked to staffing and operational efficiency in hospitality settings.

One of the main reasons for Japan's low labor productivity is the relatively low level of capital investment per worker. Fukao (2019) points out that Japan's "low capital equipment ratio" limits productivity growth. In the U.S., technologies such as automated cooking devices, Point of Sales (POS) systems, and reservation software are commonplace. In contrast, Japanese operators often rely on manual labor, which makes it difficult to improve efficiency [12].



As indicated by the Cabinet Office (2023), ICT adoption has generally lagged across Japan's service industries, with particularly slow progress in the accommodation sector. Meanwhile, the U.S. has actively implemented online booking, AI-driven personnel management, and mobile ordering, contributing to significant productivity gains [11].

Figure 1: Labor productivity per worker by industry in Japan (2023)
(Source: Autor, based on Japan Productivity Center, 2024)

As shown in Figure 1, labor productivity in Japan's accommodation and food service industries remains significantly lower than other major industries such as manufacturing and information and communications. The labor productivity shown in the figure is "labor productivity per employee, calculated by dividing the total nominal value added by the number of employees," and is based on statistical data from the Japan Productivity Center (2024) (unit: 1,000 yen/person) [13].

According to Morikawa (2016), the accommodation industry is characterized by "simultaneity of production and consumption," making it difficult to respond to fluctuations in demand [14]. In the industry, a certain number of employees must be secured to meet peak demand, but during the off-season, there is excess labor. This inefficiency is a factor that leads to a decline in labor productivity. According to research by Shigetani and Kakutani (2022), low wages and high turnover rates in Japan's accommodation industry are hindering the improvement of labor productivity. Employee retention rates are low, creating an environment in which it is difficult to develop experienced talent. This has led to poor business efficiency and, as a result, low labor productivity. [15].

Thus, the main factors behind the low labor productivity of Japan's accommodation industry is low capital equipment ratios, small-scale and labor-intensive management of companies, delayed ICT investment, difficulty in responding to demand fluctuations, low wages and high turnover rates. In order to overcome these challenges, it is necessary to utilize digital technology, expand management, improve working conditions, and level out demand. For Japan's accommodation industry to achieve sustainable growth in the future, fundamental reforms aimed at improving productivity are essential.

2.2 DX in the Tourism Industry

The introduction of technology has become a key factor in determining competitiveness in the tourism and accommodation industry.

Kim and Han (2020) conducted a study on the characteristics of smart hotels and analyzed the impact of the adoption of the latest technology on guest satisfaction. They concluded that technology is important as a factor to enhance guest engagement and practical functionality. They also pointed out that technology in smart hotels plays a role in creating emotional value rather than simply providing convenience [16]. Siguaw et al. (2000) analyzed the introduction strategy of information technology (hereinafter referred to as "IT") in the US hotel industry. This study shows that IT is directly linked to establishing a market position and securing a competitive advantage. It is also notable that it emphasized the importance of IT to operational transformation and showed a strategic direction [17].

Furthermore, Vitezic et al. (2015) analyzed the impact of the introduction of new technologies on customer experience and hotel operations. They pointed out that while new technologies increase customer convenience, there are challenges related to implementation costs and safety. In addition, they emphasize the need to consider how the use of technology should meet customer needs and balance economic risks and technical challenges [18]. These previous studies show that the introduction of technology in the tourism and accommodation industry contributes to improving efficiency and customer satisfaction, but challenges such as costs and skill gaps still exist.

In the Japanese market, the field of tourism DX has expanded significantly in recent years, and major companies are promoting proof-of-concept experiments to innovate tourism experiences and revitalize local regions using ICT technology. For example, Fujitsu is working with JTB to conduct joint research to create new tourism services for wealthy foreign visitors to Japan [19]. As part of its DX, NTT Data is conducting a proof-of-concept project to contribute to the creation of new value and streamline business processes in the tourism industry by making full use of data analysis and cloud services [20]. Furthermore, Panasonic has introduced solutions based on ICT and Internet of Things (hereinafter referred to as "IoT") technology to revitalize local regions through the digital use of tourism

resources [21]. In addition, JTB is working to strengthen its collaboration with major telecommunications companies such as NTT and KDDI to provide tourists with real-time information and create new tourism experiences using smartphone applications. Specifically, by utilizing the advanced communications infrastructure and IoT platforms of NTT and KDDI, demonstration experiments are being carried out on digital signage at tourist destinations and a tourism information distribution system using mobile devices [22].

In this way, major Japanese companies Fujitsu, NTT Data, Panasonic, and JTB are promoting tourism DX through their own different technological approaches and collaboration structures. These efforts are not limited to simply improving operational efficiency; they are positioned as strategic measures that accelerate innovation in the tourism sector and contribute greatly to revitalizing the local economy. However, there are still not many companies that specialize in tourism DX for the accommodation industry. Furthermore, from the perspective of accommodation operators, who are the users, the costs involved in introducing DX are a major issue. In this situation, some domestic companies are developing DX technologies specialized for the accommodation industry and expanding them into businesses.

"Motoyu Jinya," a traditional Ryokan in Kanagawa Prefecture, developed a cloud-based system called "Jinya Connect" to solve its unique operational issues. By incorporating onsite feedback, the system was continuously improved and has since been adopted by over 600 facilities across Japan, especially among small and medium-sized businesses [23]. Similarly, "Ebiya Daishokudo," a long-established restaurant in Ise city, Mie prefecture, created a visitor prediction and business intelligence system called TOUCH POINT BI through its in-house development division, EBILAB. By analyzing a wide range of data, Ebiya significantly increased sales and average customer spending, while reducing food waste by over 72.8%. The system has also been expanded to other restaurants and industries [24][25]. Both businesses demonstrate low-cost, internally developed DX initiatives aimed at addressing their specific management challenges. By refining these tools through practical use and extending them to similar businesses, they have established scalable models for DX that are particularly relevant for small-scale service providers.

On the other hand, THL, which is the focus of this study, is a demonstration experiment facility that develops DX specialized for the accommodation industry. In addition to accommodation, the facility has a cafe, hall, seminar room, co-working space, unmanned store, robot station, hospitality service engineering research institute, and other facilities, creating an environment for comprehensive and a bold living-lab for tourism and accommodation DX [26]. In addition, the Okinawa Tourism DX Promotion Organization (hereinafter referred to as "OTDO"), a general incorporated association, was established at the same time as THL to promote tourism DX human resource development, information dissemination on tourism DX, business proposals, and welfare and medical support from a neutral standpoint, while also contributing to the revitalization of the Okinawa region. This is a notable point that is not seen in other cases, as it has made a significant contribution to the development of tourism and regional revitalization in Japan, including Okinawa prefecture, by involving the local community and supporting companies. Moreover, the products and robots used in the facility are provided by supporting companies, and it can be said that it is different from other cases in that issues are identified through trials in the facility and improvements are made repeatedly toward implementation.

Therefore, in this study, we will consider the possibility of using technology in the domestic hospitality industry and the direction it should take through a case study of THL.

3 Research Methods

3.1 Data Collection

On December 23, 2024, a structured site visit to THL was conducted as the primary method of data collection. To ensure methodological rigor, an observation protocol was applied based on categories derived from prior literature, including technological applications, guest experience, and operational processes. During the visit, data were systematically collected through photographs, audio recordings, and written field notes. To enhance credibility through methodological triangulation, these data were supplemented and cross-referenced with publicly available sources such as official company documents, industry publications, and government reports related to tourism DX.

3.2 Analysis Method

In this study, a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) was employed to evaluate THL's DX efforts from a strategic perspective. The analysis was grounded in data collected during the structured site visit, where observations were systematically categorized according to key themes identified in the literature, such as technological implementation, user experience, and operational efficiency. Each SWOT element was derived not from impressions alone, but supported by direct evidence (e.g., system demonstrations, visual records, operational descriptions) and analyzed through the lens of established service innovation frameworks.

Furthermore, to enhance analytical depth and ensure methodological triangulation, the findings were cross-validated with external sources. These included official documents, government reports, company websites, and industry publications related to THL, TAP, OTDO, and comparable DX initiatives in Japan's hospitality sector. These supplementary sources enabled a comparative analysis and strengthened the credibility of the interpretation, helping to mitigate the limitations of single-site data collection.

Finally, the interrelationships among the SWOT components were explored to infer potential strategic directions for THL, with particular attention to the generalizability of its DX model within Japan's broader accommodation industry.

4 Data Interpretation and Discussion

4.1 Overview of THL

THL is Japan's first experimental facility for promoting DX in the accommodation industry, established in June 2023 in IT Shinryo Park in Uruma city, Okinawa prefecture. It is operated by TAP, a hotel solutions vendor founded in 1987. TAP's hotel system is known for its high flexibility and has been adopted by over 1,700 facilities, covering more than 250,000 guest rooms [27]. Regarding THL itself, the seven-story facility is equipped with a reception desk, hall, café and restaurant, co-working space, TAP Hospitality Service Engineering Research Institute, TAP THL Okinawa Office, and 38 guest rooms on the sixth and seventh floors. Etsuo Hayashi, CEO of TAP likened THL to a "car test course," and cited the establishment of the experimental facility as a reason to use it in the field and resolve any problems before introducing it to the field. He

also stated that one of the reasons for choosing Okinawa as the location was that it is geographically close to other parts of Asia and has many excellent hotels both domestically and internationally [28]. In addition, as previously described, OTDO shares a similar timeline with THL and its vision is to "improve productivity in the tourism industry by promoting tourism DX, while expressing the high value of tourism experiences and contributing to the realization of high-quality, sustainable tourism in Okinawa that is chosen by the world" [29]. It is noteworthy that OTDO is working together with the public, private and academic sectors to promote tourism DX human resource development, information dissemination on tourism DX, business proposals, welfare and medical support, etc. OTDO also addresses the issue of overtourism in Okinawa by promoting sustainable tourism practices through DX. The organization has also been selected for the Ministry of Economy, Trade and Industry's "Robot-Friendly Environment Construction Support Project" [30], and is engaged in research and development with the cooperation of participating companies with the aim of creating an environment in which robots used in hotels, offices, medical facilities, etc. can move smoothly.

4.2 Findings from the Site Visit

The following is a list of the explanations given during the tour, divided by theme and in no particular order. Please note that IT technology is constantly evolving, and the information presented in this study is based solely on the information available at the time of the tour.

・Strengthening non-face-to-face services and labor-saving measures

THL places emphasis on non-face-to-face services in order to balance convenience for guests with infection control measures. A robot linked to app orders is used to deliver food to the rooms, and a system has been established in which products are automatically delivered to the front of the rooms when placed in a box. In addition, in the restaurant, orders can be placed via QR codes installed on the tables, and drinks are made and delivered by a drink robot.

・Smart guest rooms and interfaces

The guest rooms are equipped with remote control functions for curtains, lighting, and room temperature using smartphones or AI speakers, and can also be operated by voice. An approximately 450 mm maintenance space is provided under the floor, making it easy to accommodate future updates and significantly reducing renovation costs in the long term. In addition, multiple authentication technologies (face recognition, QR recognition, vein recognition, etc.) have been experimentally introduced in the "IT box" next to the guest room door, and flexible security measures have been verified.

・Support for the elderly and disabled

In the kitchen, a tablet-based inventory management and cooking support system was introduced, and guidelines were in place that made it possible for inexperienced staff and disabled people to operate the system. The system was designed to be visually and intuitive, and measures were taken to prevent human error, such as turning on the lights on the inventory shelves and automatically updating the system using QR codes.

・Proactive facility management using robots and human-sensing technologies

Robots were utilized not only for food distribution but also for cleaning and maintenance tasks, such as transporting linen via tablet control. A human presence sensor installed in the ceiling

monitored room occupancy and contributed to the development of a system for emergency response in case of a disaster.

・Integrated information sharing and disaster preparedness across the facility

The facility was equipped with a congestion sensor and an app displaying real-time occupancy status in the restaurant. A disaster response system was also established, including a drone port and related infrastructure. In particular, based on the "Disaster Prevention Cooperation Agreement" with Uruma city, the facility is expected to serve as a regional disaster response model, with functions such as supply transportation and base utilization in emergencies.

The site visit revealed that THL integrates various technologies to enhance efficiency and guest experience across domains. From contactless services and smart interfaces to elderly and disability support, the facility exemplifies a forward-thinking approach to hospitality. Robots and sensors are used for cleaning, delivery, and emergencies. Real-time data sharing and disaster preparedness highlight the facility's multifunctional capabilities. Collectively, these innovations position THL as a comprehensive testbed for hospitality DX solutions.

4.3 SWOT Analysis

The SWOT analysis shown in Figure 2 is based on observations made during the site visit to THL and helps clarify how the facility contributes to promoting DX in Japan's accommodation industry. It organizes key points into four categories: strengths and weaknesses (internal factors), and opportunities and threats (external factors).

Strength	Weaknesses
S1: A facility where the latest DX technologies can be tested empirically	W1: There are only 38 rooms, so the sample size is limited
S2: Introducing a wide variety of robots and ICT, enabling highly versatile technology verification	W2: Closed on weekends and holidays, making it difficult to verify data during peak season, etc.
S3: Collaboration with OTDO, which is responsible for tourism DX human resource development and information dissemination	W3: Smartphones and cashless payment are required for use within the building, resulting in a biased user base
S4: Establish a cycle of product provision and improvement through collaboration with supporting companies	W4: As it is not a general lodging facility, it is difficult to evaluate the overall customer experience.
S5: Collaboration with national and local governments	W5: Geographical distance from major domestic cities (60 minutes by car from Naha Airport)
Opportunities	**Threats**
O1: Development of internet infrastructure	T1: Risk of short-term obsolescence due to rapid technological advances
O2: Tourism DX promotion policy and subsidy system	T2: Shortage of IT personnel
O3: Recovery of tourism demand and growing need for operational efficiency	T3: Intensifying competition with domestic and foreign companies
O4: Geographical advantage close to Asian markets	T4: Impact of geopolitical risks
O5: TAP's revenue growth potential due to the expansion of the tourism digital transformation market	T5: Decline in tourism due to natural disasters and epidemics, and decline in parent company sales

Figure 2: SWOT analysis table (Table created by the author)

One of THL's greatest strengths lies in its function as Japan's only dedicated living lab where hospitality DX technologies are empirically tested in real-world conditions (S1). The site visit confirmed a wide range of technologies in active use—including automated concierge robots,

smart room interfaces, and digital service platforms (S2)—which were not only observed in demonstration but also supported by internal test results provided during the visit. Notably, a 20% reduction in check-in/check-out time was recorded in internal trials, although this figure is based on non-peer-reviewed internal data and would benefit from external validation. To ensure analytical reliability, the SWOT elements were derived not only from structured on-site observations but were also substantiated by supplementary materials, including field photographs, recorded staff demonstrations, and documentation provided by THL. This triangulated approach ensured that the findings were grounded in verifiable, multi-sourced evidence rather than solely subjective impressions.

In addition to internal capabilities, strong partnerships with OTDO and public sector entities (S3, S5) support policy alignment, talent development, and ecosystem integration. These institutional ties position THL uniquely to act as both a technical and social innovation testbed.

However, critical challenges remain. The limited room count (W1), restricted operating hours (W2), and assumptions of digital literacy (W3) constrain generalizability. While the facility demonstrates proof-of-concept potential, broader application will depend on how these factors scale in conventional hospitality environments.

The SWOT assessment was based not only on on-site observations but also on data triangulated with publicly available documentation, including official materials from TAP, THL, OTDO, and industry publications. These sources enabled an initial validation of on-site claims, though further research including third-party evaluation would strengthen reliability.

Finally, while THL illustrates a forward-thinking approach, comparable efforts such as Jinya Connect and EBILAB demonstrate that other small- to medium-scale DX innovations are also emerging in Japan. THL's comprehensive integration, however, offers a distinct model emphasizing co-experiential environments and modular adaptability.

5 Conclusion

This study explored how THL's integrated approach supports digital transformation (DX) in Japan's hospitality sector. The findings highlight three major contributions.

First, THL's modular infrastructure enables rapid prototyping and iterative improvement of technologies such as automated service delivery, smart guest rooms, and sensing systems. This flexibility directly addresses labor productivity challenges while enhancing the guest experience. Second, THL's collaboration with OTDO, local governments, and partner companies has created a dynamic ecosystem that promotes human resource development, policy coordination, and regional revitalization. This stakeholder-integrated model facilitates the broader diffusion of DX practices beyond the facility itself. Third, THL's emphasis on accessibility, disaster preparedness, and future-oriented design establishes it as a resilient and inclusive model for sustainable tourism infrastructure. By integrating DX not only for operational efficiency but also for social value creation, THL demonstrates a comprehensive approach to innovation in the hospitality industry.

However, several limitations must be noted. First, this study is based on a single site visit to a relatively small-scale facility with only 38 guest rooms, limiting both the coverage and generalizability of the findings. Second, the data collection relied heavily on structured field observations and publicly available materials, without longitudinal or quantitative follow-up. Third, while the internal demonstrations and early performance indicators are promising (e.g., check-in time reduction), rigorous evaluations of cost-effectiveness, guest satisfaction, and operational efficiency are still needed to substantiate THL's scalability. Fourth, the SWOT analysis, though

systematically structured, would benefit from future research that incorporates semi-structured interviews, repeat observations, and measurable performance metrics.

In addition, systemic barriers in Japan's accommodation sector—such as high implementation costs, a shortage of skilled IT personnel, and interoperability challenges—may limit the broader adoption of DX technologies. Therefore, while this case study presents THL as a forward-looking and experimental model, it should be viewed not as a conclusive prototype but as a pioneering testbed that requires ongoing empirical validation and cross-case comparisons.

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