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Scaling Emerging Healthcare Technology: Managing Paradoxical Tensions in A Connected Health Platform

Yichuan Wang[1] | Minhao Zhang[2] | Jens K. Roehrich[3] | Rui Ma[4] | Yunkai Zhai[5,6,7]

[1]Sheffield University Management School, University of Sheffield, Sheffield, UK | [2]Operations and Management Science, Healthcare and Innovation Group, University of Bristol Business School, Bristol, UK | [3]Information, Decisions and Operations (IDO) Division, School of Management, University of Bath, Bath, UK | [4]Greenwich Business School, University of Greenwich, London, UK | [5]School of Management, Zhengzhou University, Zhengzhou, China | [6]National Telemedicine Center of China, National Engineering Laboratory for Internet Medical Systems and Applications, Zhengzhou, China | [7]Henan Province International Joint Laboratory of Intelligent Health Information System, Zhengzhou, China

Correspondence: Yunkai Zhai (zhaiyunkai@zzu.edu.cn)

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ABSTRACT

To address growing geographical disparities in healthcare access and quality, connected health platforms (CHPs) have emerged as promising solutions. However, rapidly scaling CHPs poses significant challenges, particularly in managing tensions among multiple entities. This study examines the digital scaling process of a CHP through the lens of paradox theory, focusing on tensions and their management in resource-constrained environments. We conducted a 13-year longitudinal case study of a CHP encompassing over 300 hospitals in China. Our findings reveal three distinct yet interconnected phases of digital scaling: digital foundation building; system integration and governance; and continuous improvement and innovation. We demonstrate that tensions evolve over time during the scaling process, with one dominant type prevailing in each phase, challenging previous assumptions that different tensions emerge simultaneously across multiple entities. We also identify phase-specific "both-and" responses employed by rural hospitals to manage tensions despite experiencing resource constraints. We provide guidance to organizations operating in resource-constrained environments on the management of paradoxical tensions across a complex digital scaling process.

1 | Introduction

Geographical disparities in healthcare service access, quality, and funding, especially between rural and urban areas, pose a global challenge (Guo et al. 2022). Rural hospitals often operate under severe financial constraints in the United States of America (USA), with 48% of them consistently facing financial losses from their patient services, a situation that reached its height during the COVID-19 pandemic (Karim et al. 2024). To address these disparities, connected health platforms (CHPs), leveraging diverse information and communication technologies, have emerged around the world as possible solutions (Chouvarda et al. 2019; Ko et al. 2019). A pioneering example from the United Kingdom (UK) is the Swinfen Charitable Trust, which operates a low-cost telemedicine service that facilitates connections between doctors in less and more developed regions (Swinfen and Swinfen 2002). Through partnerships with local hospitals, regional medical associations, and a broad network of doctors from around the world, the Trust not only facilitates real-time diagnostic support but also strengthens under-resourced

Summary

- We identify how different types of paradoxical tension evolve across three distinct digital scaling phases in resource-constrained healthcare environments, with belonging tension in the foundation building phase effectively being resolved through collaborative governance that balances central standards with local autonomy to enhance rural hospital engagement.
- During the system integration and governance phase, organizing tension is mitigated by strategically enforcing essential standards while permitting flexibility in non-critical areas, allowing organizations to maintain operational cohesion without stifling local adaptation.
- Performing tension in the continuous improvement and innovation phase is addressed via modularization strategies, selectively integrating critical technological upgrades alongside routine system maintenance.

rural facilities by promoting continuous training and professional development (Youngberry et al. 2024).

The demonstrated efficacy of CHPs encourages their broader adoption across healthcare systems. However, the complexities (e.g., integration with legacy systems, regulatory compliance, and user resistance) inherent in scaling these platforms may contribute to the observed high failure rate of adoption (e.g., Cho et al. 2009; Peter et al. 2015). This underscores the critical importance for scholars, healthcare managers, and policymakers to understand digital scaling—the strategic expansion of information systems (IS) infrastructures to accommodate more providers, users, and/or service offerings (Huang et al. 2017; Tatarinov et al. 2023). In this study, we examine digital scaling, specifically in the context of expanding the number of online consultations facilitated by a CHP for patients in rural hospitals to address healthcare disparities through increased access to remote medical services.

In understanding the digital scaling of CHPs, paradox theory provides a valuable theoretical lens by investigating how organizations navigate the paradoxical tensions—defined as inherently contradictory yet interdependent demands (Smith and Lewis 2011; Lewis and Smith 2022)—that manifested during the digital scaling process. While existing operations and technology management (OTM) research has investigated paradoxical tensions in various contexts and mainly in intra-organizational settings, such as IT transformations (e.g., Gregory et al. 2015), technology standardization (e.g., Lindgren et al. 2021), and operations management practice effectiveness (e.g., Bortolotti et al. 2024), very few prior studies have investigated how paradoxical tensions manifest across multiple entities (such as organizations and individuals) (Andriopoulos and Lewis 2009; Wareham et al. 2014; Wei et al. 2022). Extant literature has been calling for an investigation of paradoxical tensions beyond a single organizational level of analysis (Schad et al. 2016; Lewis and Smith 2022). Identifying and understanding how paradoxical tensions flow across entities is crucial to ensuring a more seamless scaling process and subsequent operation of a platform, which extends beyond the boundary of a single entity, examining tensions between entities bounded by a common platform (Agarwal et al. 2022; Wareham et al. 2014). Our study addresses this vital gap by examining how paradoxical tensions manifest across multiple entities of a CHP during the digital scaling process (Lewis and Smith 2022).

Managing paradoxical tensions during the digital scaling process presents significant challenges, especially for organizations operating in a resource-constrained environment—defined as an operational context characterized by limited financial capital, technological infrastructure, and specialized human resources that restrict an organization's ability to implement and scale digital innovations (Guo et al. 2022; Tong et al. 2022). While research in OTM has started to examine the distinctive challenges of operating in a resource-constrained environment (e.g., Srivastava and Shainesh 2015; George et al. 2022), paradox research has mainly investigated the management of paradoxical tensions in resource-rich organizations (e.g., Gregory et al. 2015; Lindgren et al. 2021). Our empirical focus on rural hospitals provides a rich context for examining how organizations manage paradoxical tensions when resources are limited. Thus, we posit the following research question: *In a resource-constrained environment, how do paradoxical tensions manifest across different organizational entities and how are they managed during the scaling process of a CHP?*

We address the research question through a 13-year, in-depth, longitudinal study of a large-scale CHP involving more than 300 hospitals in China. Building on rich primary and secondary datasets, we elaborate theory in this study (Ketokivi and Choi 2014), enabling us to refine and extend paradox theory by investigating the management of paradoxical tensions across multiple healthcare platform entities in a resource-constrained environment. Our study makes two distinct, yet interconnected, theoretical contributions to OTM and healthcare management. First, we reveal the temporal nature of paradoxical tensions across scaling phases, challenging existing expectations (Andriopoulos and Lewis 2009; Smith et al. 2017) by demonstrating that a single type of paradoxical tension prevails across different entities within each phase of the scaling process, rather than distinct tensions emerging at different entities simultaneously. Second, we offer novel insights into how organizations operating in a resource-constrained environment manage paradoxical tensions across different phases of the scaling process. We identify phase-specific "both-and" approaches that embrace competing demands simultaneously rather than choosing between them (Smith and Lewis 2011; Lewis and Smith 2022). Unlike "either-or" approaches that prioritize one demand at the expense of another, "both-and" approaches enable organizations to harness the benefits of seemingly contradictory elements. By identifying these phase-specific "both-and" approaches, we demonstrate how organizations can effectively balance competing demands despite limited resources.

2 | Conceptual Background

2.1 | Digital Scaling of Connected Health Platforms

The traditional understanding of scaling, centered on standardization and economies of scale (Chandler 1962), contrasts with digital scaling, which leverages digital technologies to expand rapidly user bases and service offerings (Cui et al. 2022; Svahn et al. 2017). Digital scaling expands the operational reach of an organization or system, enables

the delivery of innovative services, and facilitates entry into new markets (Huang et al. 2017). Although digital scaling can drive organizational growth and innovation, it also introduces significant challenges. These challenges may include the replication dilemma—the difficulty of duplicating successful practices across diverse contexts without losing effectiveness (Tippmann et al. 2023), and the need for synchronization—aligning new and existing processes to provide consistency as an organization grows (Giustiziero et al. 2023).

Digital scaling can be conceptualized as a process that unfolds through three distinct yet interconnected phases. The initial phase is *digital foundation building*, in which organizations establish the necessary technological infrastructure, leverage their digital core to create productive opportunities, and engage in systematic concept experimentation to develop initial digital offerings (Henfridsson and Bygstad 2013). This phase may involve rapid prototyping, small-scale trials, and efforts to attract and onboard early participants (Tan et al. 2015). The second phase is *system integration and governance*, in which organizations may develop system interoperability, establish operational guidelines, and ensure seamless coordination across the network. During this phase, digital templates are adapted to actualize specific opportunities, enhancing the platform's functionality and reach (Huang et al. 2022). The final phase—*continuous improvement and innovation*—leverages more advanced technologies to enhance service delivery and adapt to evolving stakeholder needs. This phase often involves creating solutions for future development, enabling further scaling and adaptation (Huang et al. 2022).

While these phases are conceptually distinct, they are inherently interconnected, with activities and challenges from one phase often influencing or overlapping with others. For example, the data governance policies established during the *system integration and governance* phase can significantly impact the ability to implement advanced analytics in the *continuous improvement and innovation* phase (Gregory et al. 2018). Similarly, the scalability of the initial technological infrastructure developed in the *digital foundation building* phase directly influences the ease of system integration in the subsequent phase. However, prior studies have frequently focused on an individual phase rather than conducting a comprehensive examination of the entire scaling process across the three phases (e.g., Huang et al. 2022). This approach has severely limited our understanding of how organizations navigate the entire digital scaling process, yet a comprehensive analysis of all three phases is critical to fully comprehend the processes as a whole and their component parts. A complete understanding of these phases is theoretically important because digital scaling unfolds through interconnected phases that shape how organizations expand their user bases and service offerings (Huang et al. 2017; Svahn et al. 2017). These phases require organizations to simultaneously address technical infrastructure needs, ensure system interoperability, and maintain continuous improvement capabilities (Huang et al. 2022; Tatarinov et al. 2023), while also managing resource limitations typically encountered in healthcare contexts (Guo et al. 2022; Duong et al. 2025). From a managerial perspective, there is a need to understand how early technological implementation approaches in the initial phase enable, or constrain, scaling possibilities in subsequent phases, especially in CHPs where service continuity directly impacts patient care (Agarwal et al. 2022).

The pressing need for rapid expansion of digital health infrastructures has shifted attention toward understanding how CHPs can scale up their online consultation services to reduce geographical disparities (Roesler et al. 2023; Schlieter et al. 2022). Literature on digital health services has started to demonstrate the potential of online consultations for improving healthcare access, reducing costs, and enhancing patient care (Hwang et al. 2022). The process of scaling these services to increase the number and reach of online consultations is complex because it involves integrating disparate systems, achieving conformity with a variety of regulations, and melding different organizational cultures across rural and urban hospitals (Jansen et al. 2023). Our study unpacks the digital scaling process of a CHP that is seeking to scale up the number of online consultations, applying the lens of paradox theory to examine tensions and management responses involved in this expansion.

2.2 | Paradox Theory and Managing Paradoxical Tensions

Tensions and management responses associated with digital scaling may be better understood using paradox theory (e.g., Lindgren et al. 2021). A crucial aspect of paradox theory lies in its articulation of paradoxical tensions—elements that, while individually logical, present contradictions when considered collectively (Smith and Lewis 2011). These paradoxical tensions typically manifest as two contradictory poles, or objectives, that organizations must manage simultaneously, such as exploration versus exploitation objectives (Andriopoulos and Lewis 2009). Previous research has identified four predominant types of paradoxical tensions: performing; belonging; organizing; and learning (Lewis and Smith 2022). Smith and Lewis (2011) define performing tension as those that manifest from divergent goals and strategies of stakeholders when organizations pursue multiple, often conflicting, objectives simultaneously. Belonging tension refers to the dissonance between individual and collective identities, surfacing as individuals struggle to maintain their distinctiveness while simultaneously integrating with the collective (Jarzabkowski et al. 2013). Stadtler and van Wassenhove (2016) characterize organizing tension as involving competing structures and processes, evident in the simultaneous need for control and flexibility in organizational design. Lastly, learning tension necessitates balancing the preservation of existing knowledge with the pursuit of new insights and practices, which is particularly salient when organizations must simultaneously exploit current capabilities while exploring new possibilities (Lewis and Smith 2022).

While paradoxical tension research has focused on tensions within single organizational contexts or a single level of analysis (Smith et al. 2017; Dahlmann et al. 2023), emerging studies examine how these tensions manifest across different organizational entities (e.g., Xiao et al. 2019; Wei et al. 2022). Prior studies have conceptualized these relationships as "nested tensions" primarily through hierarchical organizational

levels of analysis, examining paradoxes at individual, mid-, and senior-level management as vertically ordered phenomena within organizations (Andriopoulos and Lewis 2009). For instance, Jarzabkowski et al. (2013) show how performing tension at one level (e.g., managers' struggle with competing goals) directly shapes and is shaped by belonging tension at another level (e.g., organizational identity), creating a reciprocal cycle where responses to tensions at one level directly inform how tensions are manifested and managed at other levels within the organization. In an inter-organizational setting, Wei et al. (2022) investigate nested tensions across platform-based modular solution networks, showing how network-level paradoxes between flexibility and control cascade down to create firm-level tensions around granting autonomy versus controlling diverse module providers, thus illustrating nested relationships across distinct organizational boundaries within a hierarchical platform structure.

Paradoxical tensions, however, are not always nested in hierarchical structures. In inter-organizational settings where different entities interact through inter-organizational partnerships rather than hierarchical reporting relationships, tensions therefore may be interrelated without hierarchical nesting (Schrage and Rasche 2022). Analyzing inter-organizational collaborations (such as in CHPs) may reveal how paradoxical tensions in one entity inform and shape the manifestation of related tensions in partnering entities without hierarchical embedding (Agarwal et al. 2022). For example, Xiao et al. (2019) show that, in the context of sustainable supply chain management, the buying firm's approach to managing sustainability-efficiency tensions (i.e., performing tension) directly shapes and defines how suppliers experience and navigate their own sustainability-efficiency paradoxes, yet these entities operate as inter-organizational partners rather than in a nested hierarchy. Similarly, in this study, we examine paradoxical tensions across different organizational entities bounded by a common platform (i.e., the CHP) where urban hospitals, rural hospitals, and healthcare professionals interact non-hierarchically (Wareham et al. 2014; Agarwal et al. 2022).

Paradox theory offers insights into management responses to tensions, focusing on either the fostering of virtuous circles by valuing both poles of a tension ("both-and" approaches), or the induction of vicious circles that privilege only one such pole ("either-or" approaches; Smith and Lewis 2011; Schad et al. 2016). Recent research across various management disciplines has increasingly examined these paradoxical tensions and corresponding management responses. For example, in the context of humanitarian operations, Fernandes and Dube (2023) identify tensions between standardization and flexibility in disaster response efforts. The authors found that organizations employing "both-and" approaches, which balanced adherence to standard operating procedures with the flexibility to adapt to local contexts, made for more effective humanitarian interventions. In another study, Liang et al. (2017) investigate paradoxical tensions in the context of business IT alignment and organizational agility, uncovering tensions between the need for stable IT infrastructure and the demand for rapid technological change. They observed that organizations that managed this tension successfully adopted an adaptable alignment approach, which involved maintaining a stable core IT architecture while simultaneously creating flexible modules that could be rapidly reconfigured or updated. However, a common limitation of such studies is their tendency to concentrate on one tension and often on only one organizational entity. Such a narrow focus has been criticized for oversimplifying the multifaceted nature of tensions and their management (e.g., Smith et al. 2017; Lewis and Smith 2022).

The failure to manage paradoxical tensions effectively can have far-reaching consequences for organizations, leading to conflicting priorities and inefficient resource allocation (Smith and Lewis 2011; Schad et al. 2016). Such mismanagement can also result in decreased operational efficiency, hinder innovation, and, ultimately, lead to the failure to achieve strategic objectives (Gregory et al. 2015). In the context of scaling operations, unmanaged paradoxical tensions may manifest as resistance to change, misalignment between different organizational levels, and/or an inability to adapt to evolving stakeholder needs (Jansen et al. 2023). Such issues can significantly impede an organization's ability to scale effectively, potentially leading to missed opportunities for growth and improved service delivery (Huang et al. 2017).

The challenge of managing paradoxical tensions is further complicated by resource constraints. Organizations in these environments often have limited access to financial resources, skilled personnel, and/or technological infrastructure (Guo et al. 2022). Such constraints can exacerbate the difficulties in addressing paradoxical tensions because organizations may lack the necessary resources and expertise to manage the interplay of conflicting demands across time and entities (Roesler et al. 2023). Organizations operating in such an environment may experience lower levels of technology adoption, reduced ability to integrate new systems with existing workflows, and challenges in realizing the full benefits of health information technology (Tong et al. 2022). Unfortunately, there remains a significant gap in our understanding of how organizations operating in a resource-constrained environment may manage paradoxical tensions during the scaling process. In summary, in response to recent calls to investigate paradoxical tensions across multiple entities within telemedicine systems (e.g., Agarwal et al. 2022), we examine how paradoxical tensions emerge across different organizational entities and how these tensions are managed over time by resource-constrained organizations.

3 | Methods

3.1 | Research Design

We conducted a longitudinal, multi-source, in-depth case study (Siggelkow 2007; Weick 1993) for theory elaboration—a process that involves refining and extending existing theory (in our case, paradox theory) to enhance its explanatory power and applicability (in our case, paradoxical tensions and management responses across the digital scaling process) (Ketokivi and Choi 2014). We followed the common steps of theory elaboration, including the identification of gaps in prior studies (and positioning of a research question), empirical data collection and exploration, refinement of key theory constructs and their relationships, and then the positioning of

theoretical contributions. We iterated between theory and our study's empirical data, thereby adopting an abductive research approach (Bamberger 2019).

Adopting a longitudinal case study approach allowed for an in-depth exploration of the setting and processes, so that we can develop insights into managing paradoxical tensions by organizations operating in a resource-constrained environment (Grimm et al. 2024; Ketokivi 2006). Following Grimm et al. (2024: 4), our approach is well suited "to identify, analyze, and interpret fluid and interwoven processes." Given the sensitive nature of the phenomenon under investigation, we deemed longitudinal, retrospective, and live accounts (Langley et al. 2013) from the involved entities to be suitable for studying paradoxical tensions across the digital scaling process. We specifically followed the "process as evolution" perspective (Grimm et al. 2024), adopting a longitudinal case study to investigate the digital scaling of a CHP. By engaging with the CHP in real time throughout its scaling process, we gained detailed, live insights into the actions and activities of participating entities (Langley 1999). Additionally, we collected extensive retrospective data, thereby adopting a mixed temporal orientation (Grimm et al. 2024).

3.2 | Case Context

The cloud-based CHP serves as an integrated digital health infrastructure that connects diverse healthcare systems, enabling telehealth service delivery between urban and rural hospitals in China. The platform supports specialized online consultations in areas such as cardiology, obstetrics and gynecology, oncology, and dermatology, while also providing mobile ward rounds, emergency services, and remote clinical training. By bridging geographical barriers that restrict rural patients' access to specialized healthcare, the CHP effectively extends medical expertise typically concentrated in urban facilities to rural hospitals, thereby addressing healthcare disparities and significantly improving rural patients' access to specialist care.

The CHP's digital scaling proceeded in three phases: (i) digital foundation building; (ii) system integration and governance; and (iii) continuous improvement and innovation.

3.2.1 | Digital Foundation Building Phase (May 2010–Dec 2014)

Officially approved by the Health Commission of the Henan Province (HCHP) in May 2010, the platform's initiation under the management of an urban hospital, Zuhaf (a fictional name used for confidentiality) in the Henan province (China), marked the beginning of the scaling process. From August 2010 onwards, Zuhaf began recruiting rural hospitals to the CHP (representing the first point of contact with patients in rural areas), and established a collaborative and technologically integrated network connecting both urban and rural hospitals. During this period, pilot online consultation sessions were initiated in rural hospitals to resolve compatibility issues arising from their diverse systems. This approach aligns with extant literature, which views digital scaling not merely as post-launch expansion but as the essential preparatory phase for building the infrastructure and partnerships necessary for deployment and subsequent growth (e.g., Svahn et al. 2017).

3.2.2 | System Integration and Governance Phase (Jan 2015–Dec 2018)

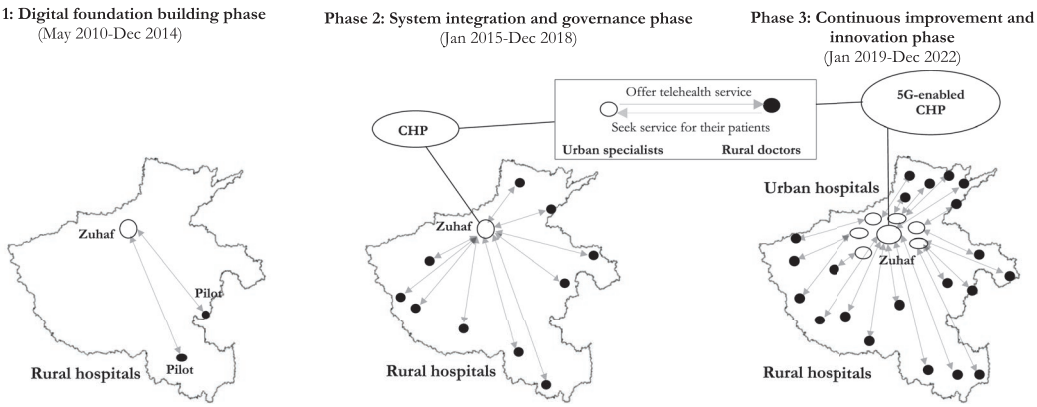
Zuhaf officially launched the CHP in January 2015, marking a significant step in the digital scaling process. Zuhaf handles the overarching responsibilities of medical oversight, management, and operation, acting as the "command center" for all coordination and management activities across rural hospitals and staff involved in the CHP. Specifically, Zuhaf offers telehealth services (e.g., healthcare consultations, remote clinical training, and emergency care) to rural hospitals, supporting patient care in regions where specialized healthcare services are lacking. Healthcare professionals in rural hospitals, acting on behalf of their patients, interact directly with the CHP's specialists (based in Zuhaf) to seek teleconsultation services for their patients.

3.2.3 | Continuous Improvement and Innovation Phase (Jan 2019–Dec 2022)

As teleconsultations continued to increase, six specialized urban hospitals (hereafter "urban hospitals") joined the CHP, driving a notable shift toward enhanced technologies and system upgrades aimed at improving the accessibility and quality of online consultations. A two-fold approach to achieving continuous improvement and innovation was conducted. First, a focus on system updates and optimization was introduced by Zuhaf's IT team, which involved better tracking of updates and the realization of technical improvements. Second, in 2022, CHP's focus transitioned to the introduction of solutions involving technological innovation (e.g., 5G technology and remote monitoring for elderly patients), which was informed by feedback received from healthcare professionals (at rural hospitals) and aimed at improving user experience and system efficiency.

Figure 1 depicts the evolution of the CHP during the digital scaling process. By the end of 2022 (concluding our data collection), the CHP included seven urban hospitals (including Zuhaf) and 300 rural hospitals. We focused on rural hospitals because they operated under substantial resource constraints, yet played a critical role in expanding access to healthcare services for patients living in rural areas. According to the National Policies on Promoting the Development of Telemedicine (2016; Supporting Information A), improving healthcare services in rural regions remains a top priority for bridging the urban–rural gap in service availability and quality. Hence, understanding how rural hospitals integrate into the CHP and manage these constraints is integral to the digital scaling process.

The roles illustrated in Figure 1 do not imply an organizational hierarchy; rather, they represent distinct entities within the CHP. Urban hospitals provide specialized medical consultations, whereas rural hospitals address local healthcare needs and frontline patient interactions. This non-hierarchical structure aligns with guidelines emphasized in both academic research (e.g., Bardhan et al. 2020) and policy documentation (e.g., The Guidelines of Telemedicine Service Management, 2018;



Key entities involved	• Zuhaf (an urban hospital): Leads and coordinates the CHP. • Rural hospitals in remote regions: Participate in the CHP to receive telehealth services.	• Rural hospitals • Rural doctors: Frontline doctors in rural hospitals, identifying patient needs and initiating teleconsultations with urban healthcare specialists (hereafter 'urban specialists') • Urban specialists: Medical experts who offer remote consultations, supporting rural physicians with complex cases	• Zuhaf, rural hospitals, rural doctors, urban specialists Urban hospitals: Newly added specialized hospitals that joined the CHP in the final phase, collaborating with Zuhaf to expand telehealth services to rural areas.
Key digital scaling activities	• Establishing connectivity for rural hospitals to join the CHP; • Formulating selection criteria for recruiting rural hospitals into the CHP; • Ensuring rural hospitals understood the CHP's vision and objectives; and • Developing a cooperation agreement defining roles, obligations, and service pricing.	• Launching the CHP as a central command center, allowing rural physicians to request teleconsultations and access care for their patients; • Detailing the technical requirements and standards for CHP to ensure it adhered to national standards; and • Equipping rural hospitals with front-end servers and completed data docking with CHP.	• CHP connected with other six urban hospitals as it continuously expanded; • Realizing various system upgrades and optimizations; • Initiating a 5G-enabled connected health project; and • Functional upgrades that resulted from iterative feedback and are aimed at improving user experience and system efficiency.
Link to next phase	The persistence of the tension identified in phase 1 highlighted the need for a more interoperable telehealth platform that balanced collective needs and localized demands.	As the CHP continued to expand, there is a need to balance the priorities of urban hospitals (system-wide standards), rural hospitals (operational constraints), and healthcare professionals (flexible patient care), aiming for a more resilient digital health framework	We ended our data collection in phrase 3, and there is no next phrase of digital scaling.

FIGURE 1 | Evolution of the CHP and its participating roles.

Supporting Information A), which underscore coordination among hospitals rather than a purely top-down control model.

3.3 | Data Collection and Sources

We adopted a multi-method approach to gather both qualitative and quantitative datasets on the CHP's digital scaling process from 2010 to 2022 (Gibbert et al. 2008). This approach allowed us to triangulate insights and strengthen the trustworthiness of our findings (Lincoln and Guba 1985). Figure 2 presents an overview of the datasets collected for each phase of the digital scaling process (Supporting Information B offering further details). To bolster the trustworthiness of the study, a range of methodological techniques were employed to mitigate potential bias (Supporting Information C; Lincoln and Guba 1985). We now describe each data source, explain how the data were used, and outline the key insights and protocol adaptations made during data collection.

3.3.1 | Archival Data

At the outset, after receiving an invitation from the CHP, the two lead authors engaged directly with the CHP Director, who facilitated various meetings to establish vital connections with the CHP's leadership team (including managing directors of hospitals, public health officials, and government healthcare officers). This also gave the two lead authors comprehensive access to rich secondary data sources from 2010 to 2014, which became foundational for in-depth research into the scaling process. Thus, we collected and analyzed 3877 pages of archival documents, and over 560 h of meeting and workshop records, spanning all three phases of digital scaling (Supporting Information A, D, and E). Documents encompassed government reports (e.g., National Policies on Promoting the Development of Telemedicine), technical guidance and system specifications (e.g., WS/T 529-2016 Basic Functions Specification of Telemedicine Information System), managerial guidance reports, and meeting/workshop transcripts. These data sources provided insights regarding healthcare regulations, CHP's technical framework, and policy directives influencing urban and rural hospitals.

3.3.2 | Field Observations

To gain firsthand insights into how tensions played out in practice, we conducted three site visits. The first site visit in 2018 involved observing 40+ online consultations, focusing on interactions between urban healthcare specialists (hereafter "urban specialists") and rural healthcare professionals. The second site visit in 2019 allowed us to observe the daily routines of the CHP Director and staff, tracking the manifestation of tensions and how they were managed. During the final site visit in 2022, we examined system upgrades and continuous improvement initiatives within the CHP. Across these visits, we compiled 50 pages of single-spaced notes, documenting real-time behaviors, dialogues, and workflows. By comparing our on-site observations with data from archival materials and interviews, we were able to validate or challenge insights, especially regarding resource allocation, coordination efforts, and technological integration. Throughout these visits, we maintained an external researcher standpoint (Zhang et al. 2024) to minimize bias and refrained from intervening in operational matters. In cases where staff felt

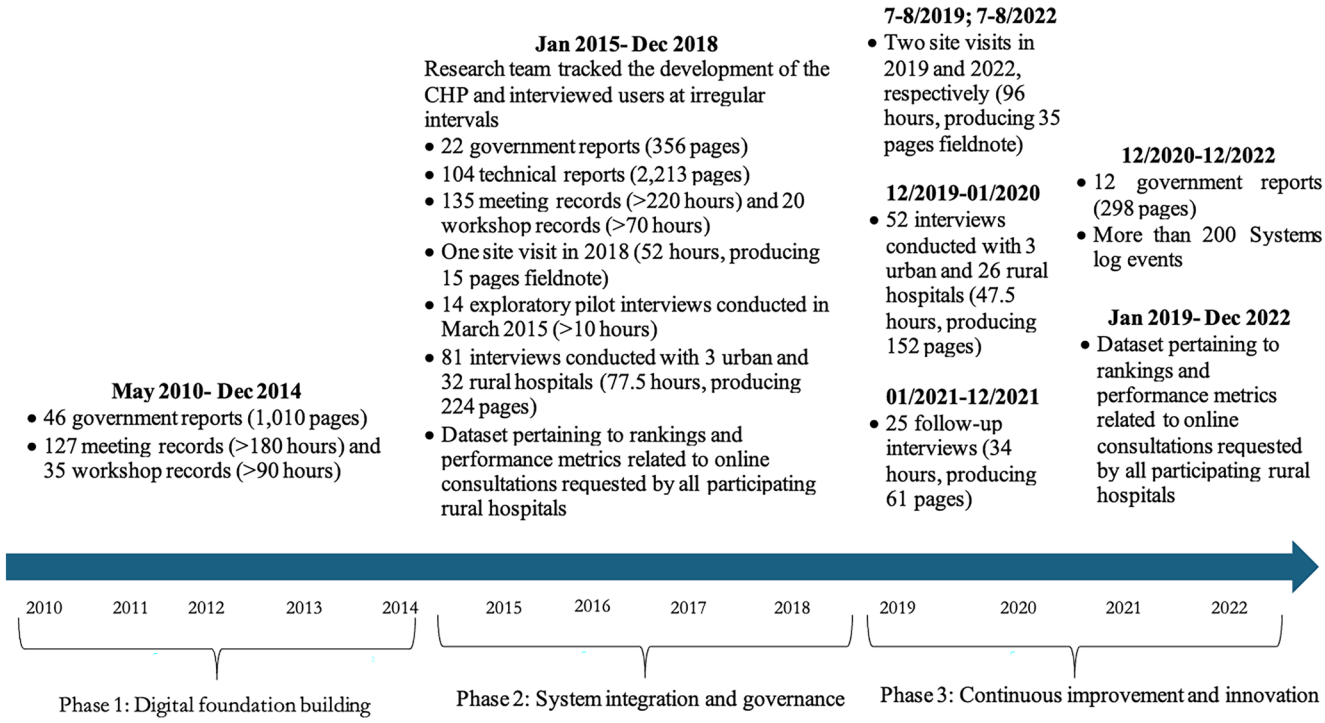


FIGURE 2 | Data collection in each phase of the scaling process.

uncomfortable being photographed or recorded, we respected their preferences by limiting photos to public or non-sensitive areas (Supporting Information F).

3.3.3 | Interviews

We employed three types of interviews, pilot, semi-structured, and follow-up, to gain insights from a range of key stakeholders within CHP. We conducted our pilot interviews in March 2015, involving 14 participants, among them the CHP Director, doctors, managing directors, IT staff, and administrative personnel from both urban and rural hospitals. These interviews served two primary purposes: (i) to develop a preliminary understanding of the CHP's operational processes, roles, and potential tensions; and (ii) to test and refine our interview protocol.

From late 2015 to late 2021, we conducted 150+ hours of official semi-structured interviews with 100+ interviewees (Supporting Information G). Our main objective was to explore paradoxical tensions and management responses during the "system integration and governance" and "continuous improvement and innovation" phases. We updated our interview protocol following the pilot interviews, adding targeted prompts about how rural hospitals grapple with tensions. The interview protocol was organized into three parts, each addressing a facet of the CHP's digital scaling (Supporting Information H). Part 1 focused on how the CHP might influence service delivery, resource configuration, and outcomes; Part 2 explored potential disruptions, challenges, and barriers encountered in scaling; and Part 3 investigated management responses for handling these challenges. We interviewed the CHP Director, hospital directors/managers/IT directors, and healthcare professionals spanning urban and rural hospitals.

To select the interviewees, we categorized rural hospitals by engagement levels in the CHP, ranking them in descending order according to the volume of online consultation requests. In line with Zhao et al. (2019), we classified the top 10% of rural hospitals as high-engagement hospitals—those with significant utilization of the CHP's online consultation services. Conversely, we designated the bottom 10% as low-engagement hospitals, characterized by minimal usage, with only one consultation request recorded. This segmentation informed our sampling strategy for interviews. Specifically, we selected interviewees from both high- and low-engagement rural hospitals to capture a broad spectrum of responses to paradoxical tensions and their management (or lack thereof). By comparing how these two categories of hospitals navigated the CHP's digital scaling process, we were able to examine how management responses to tensions may be influenced by their engagement levels.

In Phase 2, we identified 14 hospitals in each category based on their 2015 consultation volume, to ensure representation of both categories of engagement (i.e., high and low). Our initial sampling frame thus included 28 rural hospitals from the CHP's participants in 2015. However, in practice, we conducted interviews with 32 rural hospitals in Phase 2—a slight increase from the 28 originally anticipated. This discrepancy arose from oversampling and strong participation rates. In qualitative interview research, it is often prudent to recruit more participants than strictly needed to buffer against non-response or dropout. We invited a few additional hospitals beyond the exact top and bottom deciles to ensure sufficient respondents. Importantly, these additional interviews did not stray from our focus on high- and low-engagement.

In Phase 3, the CHP had scaled up to 223 participating rural hospitals in 2019. We applied the same sampling logic using

2019 consultation log data. The top 10% (appr. 22 hospitals) and bottom 10% (appr. 22 hospitals) of performers were identified as high- and low-engagement categories, respectively, based on their online consultation request volumes. This yielded 44 target hospitals for potential interviews. We extended interview invitations to all 44 of these rural hospitals, and ultimately, 26 (out of 44) rural hospitals participated in Phase 3 interviews. The 26 hospitals we interviewed in Phase 3 turned out to be virtually the same set of hospitals we had engaged with in Phase 2. In essence, the high- and low-engagement hospitals that responded in 2019 were largely the same hospitals that had been in the top or bottom categories in 2015 and had already been in contact with us during the earlier phase. This overlap reflects a stability in CHP engagement levels over time and aligns with findings in the broader healthcare context. For example, Karim et al. (2025) find remarkable stability (and resistance to change) in telehealth adoption levels among U.S. rural hospitals.

Following these semi-structured interviews, we conducted 25 follow-up interviews from January to December 2021. The purpose was to evaluate the interventions and strategies implemented during the "continuous improvement and innovation" phase, assess their long-term effectiveness, and identify any ongoing or new challenges healthcare professionals faced in the evolving digital scaling process. This final set of conversations helped us capture how participants' perspectives and strategies adapted over time, offering a more comprehensive understanding of the CHP's progression.

All interviews were conducted in Mandarin to allow participants to express themselves naturally and minimize language barriers. We then translated each interview into English and performed a back-translation to ensure accuracy. The semi-structured format enabled us to adapt our questions as new themes emerged. However, some interviewees in rural settings were initially hesitant to discuss operational problems. To address this, we emphasized relationship-building (e.g., informal conversations, reassurances of confidentiality) before initiating formal interviews.

3.3.4 | System Log Data and Quantitative Metrics

We also examined 203 system log entries documented between 2020 and 2022, capturing software updates, technical glitches, service operation issues, and managerial concerns (Supporting Information I). These logs provided timestamped records that we subjected to process mining methods (Pentland et al. 2021), enabling us to detect how technical and managerial changes overlapped with tensions and management responses over time. By cross-referencing log timestamps with meeting notes and interview data, we identified challenges leading to management responses (e.g., severe technical failures that spurred additional training or policy adjustments). Because patient confidentiality was paramount, we redacted, or anonymized, sensitive information in these logs. Some entries lacked sufficient details, prompting follow-up interviews with IT staff (in urban and rural hospitals) to clarify the nature of the reported technical issues.

In addition to the system log data, we also collected rankings and performance metrics on online consultations requested by the participating rural hospitals from 2015 to 2022. These numerical indicators helped us to assess the adoption, reach, and effectiveness of telehealth services within the CHP. In turn, we used them to triangulate our insights derived from qualitative datasets, verifying trends such as increased consultation uptake after newly introduced platform features or major policy changes. All consultation logs were also manually reviewed to identify any COVID-19-related cases, and only a handful of severe COVID-19 consultations were found. These cases were managed through CHP's separate COVID-19 pathway.

3.4 | Data Analysis

We adopted a detailed and iterative approach to data analysis, employing NVivo software. We arranged our diverse data sources into chronological order to ensure a comprehensive analysis through thematic analysis (Gioia et al. 2013). By aligning data chronologically and thematically with these three phases, we were able to trace key events in the scaling process and could capture how tensions and responses evolved over time. We conducted data collection and analysis in tandem, coding our data in parallel with further data collection. This integration facilitated the continuous refinement and adjustment of our data collection in response to emerging insights, ensuring that our research remained adaptive throughout our study. We now outline our three-step coding procedure: (i) open; (ii) axial; and (iii) selective coding.

3.4.1 | Step 1—Open Coding

Data from multiple sources were coded to arrive at a timeline of events representing the scaling process between May 2010 (when the CHP was officially approved) and December 2022 (conclusion of the "continuous improvement and innovation" phase). We began by categorizing the raw data into manageable first-order concepts. This involved assigning preliminary codes to segments of data that described their basic content and meaning. Each data snippet—relating to, for instance, identified paradoxical tensions, or management responses—was tagged with provisional labels that captured its essence (e.g., performing, belonging, or organizing tension; Gioia et al. 2013). Thereafter, we consolidated similar coding to establish our initial set of first-order codes. As these codes naturally clustered around specific time periods and activities, we could associate them with each phase.

3.4.2 | Step 2—Axial Coding

We aligned our initial set of first-order codes with existing research on paradoxical tensions (e.g., Lewis and Smith 2022; Wei et al. 2022), and digital scaling (e.g., Huang et al. 2017; Tatarinov et al. 2023), allowing us to detect significant patterns and interconnections among core codes (e.g., type of tension, and phase of the digital scaling process). This step involved substantive coding, in which we used key concepts from extant studies to refine our data and establish relationships between concepts. Through this process of empirical data analysis contextualized by theoretical frameworks

(Strauss and Corbin 1990), we crafted detailed narratives for each phase of digital scaling that described how and where paradoxical tensions manifested and how management responses were used to mitigate them. These comprehensive descriptions were corroborated by key informants. This coding procedure resulted in a robust classification of data into primary and secondary categories, ensuring a clear "trail of evidence" that linked our analytical conclusions directly back to the underlying data (Supporting Information J–L). We visually differentiated the data sources by using broken lines in Supporting Information J–L to clearly identify the distinct tensions and responses from different entities. As an author team, we also evaluated the codes for their robustness, checking for consistency, possible overlaps, and any data gaps, ensuring that findings were comprehensive, accurate, and replicable.

3.4.3 | Step 3—Selective Coding

In our final step, we followed up on the results of our axial coding with another round of interviews with key respondents in rural hospitals. We also used quantitative metrics to classify the engagement levels of rural hospitals participating in the CHP by ranking them according to the volume of online consultation requests they initiated. Each hospital was assigned a rank in descending order, with the top 10% classified as high-engagement hospitals (i.e., significant utilization of the CHP's online consultation services) and the bottom 10% as low-engagement hospitals (i.e., minimal use of the online consultation services). This method of segmentation (suggested by Zhao et al. 2019) helped us understand how rural hospitals' different management responses to paradoxical tensions affected CHP engagement.

Throughout the analysis, the two lead authors engaged in a continuous dialogue, revisiting datasets to refine codes and themes. Where disagreements arose (e.g., regarding a code's meaning, or its assignment to a phase), we re-examined the relevant data, consulted additional sources, and, if needed, sought the perspectives of a third co-author. If discrepancies persisted, the entire author team convened to review the contested codes or themes to reach consensus. Finally, we validated our in-depth case description (across phases) with key informants.

By explicitly aligning our open, axial, and selective coding with the three phases of digital scaling, we ensured our analysis was both grounded in rich empirical data and theoretically informed. We used metrics such as the volume of consultations requested by rural hospitals to cross-check the insights gained from our qualitative data and to confirm patterns. This approach allowed us to trace how tensions and management responses unfolded over time and demonstrate their impact on the scaling process and CHP engagement.

4 | Findings

We outline our findings to illuminate the process of digital scaling of a CHP. Following three distinct, but interrelated, phases of the digital scaling process, we evidence salient paradoxical tensions across phases. We then develop insights that provide an understanding of how paradoxical tensions were (not) managed by rural hospitals.

4.1 | Paradoxical Tensions During the Digital Scaling Process

At the inception of the CHP, the CHP Director delivered an opening talk, emphasizing a clear and pressing need *"for successful scaling to tackle significant disparities in healthcare access and medical resource allocation that many of our communities endure. [...] Particularly in our rural areas, the scarcity of specialized medical services has severely impacted the health and well-being of numerous individuals."* This statement clearly drew out the need for a successful scaling process to tackle disparities regarding health service delivery between urban and rural areas.

4.1.1 | Phase 1—Digital Foundation Building Phase: Belonging Tension

Zuhaf, the organization leading the CHP, faced an identity conflict at the outset: it wanted to preserve its own distinctive telehealth practices while still complying with the national telehealth standards (as mandated by the *Opinions of the National Health and Family Planning Commission on Promoting Remote Medical Services*, Supporting Information B). These national standards aimed to create consistency across urban and rural hospitals, but they risked overriding some of Zuhaf's specialized teleconsultation methods. This tension arose from the dissonance between aligning with national healthcare policies that prioritized centralization (e.g., emphasizing standardization and uniform data protocols) and addressing local healthcare needs through decentralized, tailored solutions. While a centralized strategy aligned with national goals, it risked overlooking unique local healthcare conditions. Conversely, a decentralized approach supported local responsiveness but risked departing from national standards. The CHP Director articulated this belonging tension during a 2014 meeting, saying, *"We navigated between our unique vision and national healthcare policies, aiming to reconcile our autonomy with overarching directives that sometimes conflicted. Our objective was to enhance access to quality treatment locally, aligning with national goals yet facing challenges in balancing the distribution of medical resources and improving diagnostics within telehealth care"* (Meeting record; April 2014).

Decisions on strategic orientation made by Zuhaf had a ripple effect on how rural hospitals and healthcare professionals perceived their roles and identities, intensifying belonging tension, particularly in resource-constrained environments. In such settings, rural hospitals struggled to adjust their limited resources to meet the demands of integrating into the CHP's standardized framework. For example, conflicts emerged over data reporting and treatment protocols, as rural hospitals faced challenges in meeting IT compliance requirements with insufficient infrastructure and support. One rural Managing Director noted: *"Mandating a standardized data format delayed [our] telehealth integration by approximately three months, as it conflicted with [our] existing workflows and exceeded the hospital's technical and administrative capacity."* This illustrates how a one-size-fits-all

standard (centralized approach) clashed with a rural hospital's established practices, intensifying the sense of being an outsider to the process.

In response, rural hospitals experienced their own belonging tension: whether to adopt an opportunistic mindset, maximizing self-gain, status, and resource accumulation, or a cooperative mindset, prioritizing collective success within the CHP framework. This tension reflects a deeper identity struggle—rural hospitals wanted to retain autonomy to address local healthcare priorities, yet they also recognized that their long-term success was dependent on cooperation and synergy within the CHP. A Managing Director (rural hospital) explained: "*Joining the CHP initially appeared as an excellent opportunity to enhance our profile and capabilities. However, aligning with the broader [CHP] goals sometimes means compromising our own strategies and autonomy. There have been instances where we had to adjust our local priorities, which has occasionally led to internal debates on whether the trade-offs are justified by the benefits*" (Meeting record; August 2014).

The strategic orientation to centralize or decentralize magnified belonging tension for rural hospitals, depending on how rigidly standardized requirements were enforced or how much autonomy was granted in adapting them. When centralization prevailed, rural hospitals found their autonomy constrained, often leading to resistance or opportunistic behavior as they sought to protect local interests. In contrast, a decentralized approach gave rural hospitals more control over decision-making, such as tailoring data reporting protocols or clinical workflows to fit local realities. This flexibility fostered a more cooperative mindset, strengthening partnerships with urban hospitals and specialists. A Managing Director (rural hospital) described this tension: "*When the urban hospital insisted on a uniform reporting standard, we felt torn between following their rules and tailoring services to our local context. It made us question whether we still had any say in shaping patient care, and whether we truly belonged in a partnership or were just expected to comply.*"

Within rural hospitals, healthcare professionals faced their own belonging tension, struggling to balance between maintaining their clinical independence (preserving professional identity) and adhering to telehealth protocols (embracing a new role as telehealth collaborators). A doctor (rural hospital) reflected on this tension: *"As we started integrating CHP into our care delivery, I had personally noticed an unsettling trend where our clinical judgment was second-guessed. It was as if the autonomy we once had in making crucial decisions for our patients was slipping through our fingers. We needed to address this erosion of decision-making power; otherwise, it would have undermined my own and my colleagues' ability to provide care that is tailored to our patients' needs"* (Meeting record; November 2013). These constraints were often driven by urban specialists overseeing telehealth consultations, which rural doctors perceived as undermining their local expertise. This created friction, as rural doctors felt their long-standing clinical knowledge was dismissed, leading to frustration and even distrust. A rural doctor expressed this sentiment: "*It felt as if our years of clinical experience counted for less now. The specialists from urban hospitals frequently dismissed our judgments, undermining the trust we had built with our patients*."

The identity struggle experienced by rural doctors became a catalyst for change within their institutions and prompted Zuhaf to reconsider its approach to managing the CHP. Initially, rural doctors expressed significant frustration, as rigid clinical protocols and limited autonomy undermined their professional identity. Their feedback, however, prompted CHP leadership to respond by enhancing IT support and introducing greater flexibility in clinical protocols, moving away from the earlier rigid, one-size-fits-all approach. Interestingly, this shift created its own form of belonging tension for Zuhaf. Previously positioned as primary decision-makers, they now had to redefine their role to belong in a more egalitarian partnership. Consequently, this adjustment led CHP leadership to revise its approaches regarding resource distribution to foster a more inclusive and cooperative telehealth environment.

Belonging tension surfaced across urban and rural hospitals, as well as among rural healthcare professionals, during the process of establishing the CHP's digital foundation. Each entity sought to preserve its distinct roles and identities, while simultaneously integrating into the CHP's telehealth initiative. Following the official launch of the CHP in 2015, the CHP progressed to the system integration and governance phase focused on enhancing interoperability, strengthening governance structures, and balancing national objectives with local healthcare needs to ensure sustainable and effective telehealth services.

4.1.2 | Phase 2—System Integration and Governance Phase: Organizing Tension

In the second phase, the CHP prioritized ensuring interoperability across diverse rural hospital systems, leading to an organizing tension. With interoperability among all participating rural hospitals confirmed as a top priority for the CHP, urban hospitals established standardized IT policies demanding strict IT compliance and led the drafting of system-wide policies for telehealth usage. Their policy incorporated penalties for nonadherence and incentives for compliance: *"Party B's [rural hospital's] annual online consultation requests must exceed 200, with over 3000 participants in online medical education per year, and the remote electronic library must have over 100,000 views and over 20,000 downloads per year."* Rural hospitals meeting these performance targets received additional support, including: *"The priority to join academic and technical exchange workshops and forums led by Party A [urban hospitals]" and "The right to obtain scientific research reports based on the medical health data collected by Party A"* (described in the CHP Cooperation Agreement).

The policy was intended to drive more teleconsultation requests among all participating rural hospitals. However, the strict performance targets set by the CHP often exacerbated the organizing tension in rural hospitals, forcing them to navigate a paradoxical tension between standardization and adaptation. On one hand, there was the need to comply strictly with standardized protocols to secure incentives (e.g., academic exchange opportunities and access to research data). On the other hand, there was an imperative to adapt these protocols to fit local operational constraints such as limited technical resources, staffing shortages, and varying levels of

digital literacy among healthcare professionals. This tension prompted the need for local adaptation, where rural hospitals modified workflows, adjusted consultation processes, and implemented workarounds to accommodate resource constraints while still striving to meet IT compliance. One Managing Director (rural hospital) explained: *"We were expected to hit the number of online consultations each month. If we did not, we could lose funding (e.g., some travel funding to participate workshops or forums) or our eligibility for additional support. But our local situation changes day to day: sometimes we lack capacity to run all those sessions on schedule. We ended up juggling these rules on one side and our real patient needs on the other."*

Organizing tension occurred as one entity's actions (e.g., urban hospitals' imposing IT compliance) directly shaped and amplified the constraints and responses of the other entities. One rural hospital's Managing Director illustrated: "*We had to submit patient scans in a specific format that was compatible with the urban hospital's platform [CHP], but our older imaging systems often generate files that do not meet those requirements. It slowed down every consultation: we will spend more time converting files or redoing scans just to match the guidelines. That extra step frustrated our staff, and patients ended up waiting for care*." A site visit in 2019 revealed similar challenges. As shown in photo 1 (Supporting Information F), a rural doctor uses two computers during teleconsultations, one for accessing the CHP platform and the other for viewing medical images from the local health system due to compatibility issues. Photo 2 illustrates staff members frequently troubleshooting file-format incompatibilities.

The organizing tension that rural hospitals faced—balancing adherence to uniform standards with adapting to local realities—edspilled over into contradictions experienced by rural healthcare professionals. They encountered their own tension between relying on formal coordination mechanisms and the need for reciprocal, flexible coordination in rural settings. On one hand, formal coordination, with clearly defined roles and responsibilities, provided clear structure and process in telehealth operations. As a doctor from a rural hospital's cardiology department noted: "*Everyone knew their roles and responsibilities to avoid confusion and ensure efficiency during consultations*." However, the unpredictable realities of rural healthcare service delivery often required a more reciprocal coordination approach, where close collaborations between rural doctors and rural hospital managers were essential to address emerging challenges. For example, when technical or administrative issues arose, healthcare professionals would escalate their concerns to rural hospital managers or urban hospital administrators. This process often led to policy adjustments, additional training, or reciprocal support to resolve these challenges. As an administrative assistant (rural hospital) noted: "*While guidelines helped set a clear structure, in reality, we often had to improvise when things did not go as planned. Technical issues popped up unexpectedly, and there was no time to follow lengthy procedures. We relied on quick decisions and teamwork."*

While reciprocal coordination provided greater flexibility and responsiveness to on-the-ground issues, it also led to inefficiencies due to its reliance on informal, personal relationships, and ad-hoc problem-solving mechanisms. This created inconsistencies in how challenges were addressed across different rural hospitals, leading to variations in the quality of telehealth service delivery. A doctor (rural hospital) reflected: "*While it was helpful that we can quickly reach out to colleagues or managers when issues came up [using WeChat, a widely used communication platform in China similar to WhatsApp], it often felt unstructured. Sometimes the way we solved a problem here is completely different from how another hospital handles the same issue. This inconsistency not only wasted time but also affected the quality of care we could provide*." This highlighted a critical aspect of organizing tension: while reciprocal coordination fostered adaptability and local problem-solving, it also risked creating dependency on reactive measures rather than promoting systemic formal solutions.

Although the CHP had achieved a higher degree of coordination, by late 2018 the increasing volume of teleconsultation requests and system inefficiencies underscored the urgent need for further improvements. In response, the CHP transitioned into a continuous improvement and innovation phase focused on refining the platform through new technologies and targeted technical fixes to ensure long-term system stability.

4.1.3 | Phase 3—Continuous Improvement and Innovation Phase: Performing Tension

During the third phase of the CHP scaling process, the focus shifted toward continuous improvement and innovation, aimed at addressing persistent challenges in rural healthcare environments by the CHP. Despite significant progress made during system integration in phase 2, the growing volume of teleconsultation requests exposed systemic inefficiencies, such as limited bandwidth, outdated infrastructure, and suboptimal platform functionalities. To address these inefficiencies, there were two options for the CHP: (i) introducing advanced technologies such as 5G connectivity and remote monitoring for elderly patients, which presented opportunities to enhance care quality and accessibility; and (ii) focusing on continuous improvements, optimizing current processes, and fixing system inefficiencies identified through system logs. However, these options highlighted a performing tension, which stemmed from the conflicting pursuit of the CHP's social and financial goals. Specifically, this tension became salient as the CHP faced competing demands to improve service accessibility and patient outcomes through technological innovation, while simultaneously maintaining cost efficiency through continuous improvements within the existing platform.

This tension was voiced by rural healthcare professionals, who were advocating for improvements and innovation to better address patients' care needs. Healthcare professionals faced a performing tension between two competing goals. On the one hand, they recognized that the adoption of new technologies could significantly improve healthcare outcomes by enhancing diagnostic accuracy, patient monitoring, and real-time consultations. For instance, 5G networks facilitated seamless, high-definition teleconsultations, while remote monitoring devices enabled continuous health tracking for elderly patients, reducing emergency incidents. A doctor (rural hospital) expressed this tension: "*It was about creating a lifeline for many of our patients,*

especially the elderly who cannot easily travel. For them, having remote monitoring devices can mean the difference between a regular check-up and an emergency. These devices helped us track their health daily, making sure any changes in their condition are caught early."

On the other hand, these advancements introduced considerable learning costs (e.g., time and resources required for training) and translational costs (e.g., adapting clinical workflows to new systems). This was reflected by an IT Director (rural hospital): "*We were at the frontlines of telehealth, and it was clear that some of our tools became outdated quickly. We were supposed to be in the business of cutting-edge healthcare, and that was what our doctors told me, but our telehealth platform needed a serious upgrade for us to truly make a difference in our patients' lives*." A doctor (rural hospital) also expressed concerns about the financial implications: "*While new technologies are transformative, the cost of adopting and maintaining them is overwhelming. It was not just the equipment, it was the training, system upgrades, and the resources needed to keep everything running smoothly.*"

The performing tension experienced by rural healthcare professionals spilled over into rural hospitals, influencing decisions around resource reconfiguration. They were caught between investing in new technologies to meet evolving healthcare demands and maintaining existing CHP practices to ensure operational stability. Some rural hospitals actively supported the adoption of new technologies, viewing them as essential investments for long-term healthcare improvement. These hospitals prioritized advanced connectivity upgrades and integrated more comprehensive remote patient monitoring devices connected to the CHP to improve chronic disease management. Their goal was to invest upfront, anticipating that the long-term benefits in patient outcomes and operational efficiency would outweigh initial costs.

Other rural hospitals, however, hesitated, prioritizing the optimization of current systems, arguing that modest upgrades could deliver sufficient benefits without over-stretching their financial resources. They embraced incremental improvements to enhance the quality of telehealth services. Improvements included adjusting system settings (e.g., appointment conflict notifications and displays of patient and expert information after scheduling), and creating new interfaces or functions (e.g., adding video consultation room inquiry modification interface and automated SMS reminders). These adjustments may address operational bottlenecks without incurring substantial costs. A managing director (rural hospital) noted: "*Our role in providing additional resources to support our doctors in adopting the changes was crucial. We needed to ensure these changes were smoothly integrated into our operations. [...] We appreciated the system enhancements but adapting to them required thoughtful resource management on our part*."

The tension within rural hospitals also influenced urban hospitals, compelling them to reassess and potentially redefine the goal of the CHP. Urban hospitals faced strategic decisions about the CHP's future direction. The growing demands from rural hospitals raised critical questions: Should the CHP prioritize its social mission, committing substantial investments to technological innovations that address rural healthcare inequity?; Or should it focus on maintaining financial sustainability, ensuring that resources are allocated efficiently to support long-term viability? The CHP Director reflected: "*We were facing a challenge here as we sought to expand our telehealth's social value while at the same time tightly managing our financial burden. Our commitment to integrating 5G technology was crucial to enhancing patient care and service accessibility. While such improvements promised to revolutionize service delivery, they came with a hefty price tag*."

Taken together, phase 3 illustrated how performing tension rippled across the CHP. This performing tension highlighted competing goals of continuous improvement and innovation within the CHP, particularly in a resource-constrained environment. In promoting healthcare equality in rural regions, the CHP had to balance the social benefits brought by technological innovation with the need to maintain financial stability.

4.2 | Management Responses to Paradoxical Tensions During the Digital Scaling Process

4.2.1 | Management Responses to Belonging Tension in the Digital Foundation Building Phase

During the digital foundation building phase of the CHP (around April 2013), Zuhaf attempted to balance centralization with local autonomy. At that time, Zuhaf implemented a strict contractual agreement to standardize critical operations (clinical standards, patient data management, teleconsultation workflows, IT security protocols) across the CHP network. However, the contractual agreement often clashed with the rural hospitals' desire for autonomy, particularly in managing patient data and local care practices. To address these competing demands, Zuhaf initially adopted an "either-or" response, emphasizing strict compliance. The CHP Director highlighted the struggle to align these divergent needs: "*When we started building our healthcare network, it was crucial to have everyone on the same page, so we set up strict rules through formal contracts. These contracts were not just pieces of paper; they came with penalties if not followed. This approach helped to ensure that all our rural hospitals stuck to the agreed-upon guidelines. We did this to make sure that no matter where you are in our network, you can expect the same high quality of care*" (Meeting record; April 2013).

This strict, either-or approach resulted in "ceremonial conformity" among most rural hospitals. They did attend the required workshops and signed the agreements to show formal compliance, but in day-to-day practices clearly many continued to operate independently. Rural hospitals sought to leverage the CHP to enhance their own resources and reputation, often while avoiding full CHP integration. A managing director (rural hospital) explained: "*We had been part of the CHP from the start. On paper, it looked like we were fully on board. But to be honest, we had hit some real snags putting it all into practice. Integrating this new digital service and sharing patient data – it had been a slower process than expected. We had our concerns about how it all fitted with our current systems and how secure the data sharing was. [...] These changes took time and needed to fit into our way of doing*

things without compromising our patients' trust or our hospital's operations."

This response from rural hospitals, however, while establishing a baseline of compliance, exposed its limitations in fostering genuine engagement. By 2014, seeing the limitations of the strict approach, Zuhaf shifted to a "both-and" approach. This balanced response sought to maintain necessary central controls while empowering local autonomy in the rural hospitals. Specifically, this response involved facilitating collaborative policymaking through structured dialogue to integrate rural hospitals' local needs into the CHP's broader operational framework. Our data show that, in 2014, the CHP conducted 15 workshops and 27 meetings with rural hospital directors and healthcare professionals (Supporting Information E). These sessions were designed to jointly develop strategic directions and practical solutions. In addition, CHP leaders gathered and integrated feedback from the rural hospitals to address local challenges and improve the platform's functionality. The CHP Director reflected on the effectiveness of these collaborative policymaking sessions, stating: "These sessions proved invaluable for fostering cooperation and allowed us [urban hospitals] to address and adapt to the specific needs and challenges faced by each hospital. Through open dialogue, we uncovered practical solutions that have since been implemented across rural hospitals in other regions in China" (CHP Director).

These collaborative policymaking activities enabled the CHP to identify clearly and address the rural hospitals' specific resource needs. Through structured dialogues, the CHP recognized rural hospitals' requirements for resources such as shared training sessions and opportunities for joint procurement of equipment, knowledge transfer from urban specialists, and technical assistance. Consequently, rural hospitals could acquire critical digital capabilities without over-stretching their limited financial budgets. Moreover, these collaborative interactions provided rural hospitals with greater clarity on effectively integrating centralized CHP standards into their local operations, helping them balance local autonomy with necessary standardization. Ultimately, rural hospitals were able to leverage more systematically urban hospitals' resources, including joint training programs, knowledge transfer initiatives, and technical assistance from urban specialists, to strengthen their local healthcare delivery. Although these interactions were limited at first, rural hospitals began to perceive the potential benefits of collaborative efforts. They anticipated that joining the CHP could enhance the ability to manage complex patient cases locally, thereby reducing the need for patient transfers and improving healthcare access in remote areas: *"Online consultation services had the potential to bridge the expertise gap significantly, allowing us to deliver urban-level care to our patients"* (Managing Director, rural hospital). Additionally, rural healthcare professionals found these interactions enriching, as collaborative policymaking dialogues allowed them to articulate their local challenges and receive practical advice tailored specifically to their context. One healthcare professional from a rural hospital expressed the mutual learning outcomes from these exchanges: *"It was enlightening to see the medical advice was useful for our local patients, and it was a two-way street – we learn about the new treatment from our urban colleagues and they learn from our settings and the challenges we are facing"* (Healthcare professional, rural hospital, during a network integration workshop in 2014).

Despite this progress, a few rural hospitals still viewed the CHP as a competitive threat due to their close geographical proximity to an urban hospital. As collaboration between urban and rural hospitals within the CHP increased, so too did competitive tensions when a rural hospital, closely located to an urban hospital, experienced that some patients chose to bypass their local rural hospital in favor of a direct consultation at a nearby urban hospital. The Managing Director (rural hospital) explained: "*CHP provided telehealth services that we believed could help to improve the quality of our medical care and relieve our patients' suffering. [...] However, we are 20 min away from the next urban hospital. Having been provided with a consultation by the [urban] hospital, patients often preferred to [then] consult directly with that hospital instead of staying at our hospital for a remote consultation. In this case, we were no longer collaborators but competitors*."

During a workshop, another managing director (rural hospital) echoed these concerns: *"Despite viewing this collaboration as an opportunity, we [hospital directors] were concerned about patient retention. After receiving initial consultations through the CHP, patients often chose to pursue further treatment directly [at the urban hospital]."* Nevertheless, the shift toward a more balanced management approach, characterized by fostering dialogue and shared understanding, led to tangible outcomes. The number of rural hospitals participating in the CHP increased from 119 in 2013 to 137 in 2014 (Figure 3). This growth reflects the successful transition in management responses, highlighting the increased recognition and acceptance of CHP's value among rural hospitals.

4.2.2 | Management Responses to Organizing Tension in the System Integration and Governance Phase

The organizing tension identified in this phase revolved around the inherent challenges that arose when centralized IT policies implemented by urban hospitals within the CHP encountered the diverse operational realities of rural hospitals. To address the tension, rural hospitals again adopted a "both-and" approach, which involved the implementation of strict IT policies for essential functions, to maintain system integrity, while allowing flexibility in less critical areas. For example, in the case of data security, rural hospitals adhered strictly to the CHP's encryption standards and privacy protocols to protect patient information during online consultations: *"Ensuring [that] our patients fully understood the online consultation process was crucial, especially when it came to their rights and what they could expect from the service"* (Managing Director, rural hospital). However, while strict adherence to IT policies is non-negotiable in critical areas, rural hospitals were granted some leeway in less critical domains to enhance service accessibility and patient satisfaction. For instance, rural hospitals might adjust the appointment scheduling to offer more flexible timing options, which are more aligned with the local community's lifestyle, such as late evenings, or early mornings, consultations to accommodate working patients for those involved in farming activities.

Recognizing the value of local adaptations, urban hospitals shifted from a strict "either-or" IT compliance model to a supportive "both-and" approach, balancing core standards with rural-specific needs through technical support, resources, and incentives. This improved CHP's interoperability by bridging rigid compliance with operational flexibility. The CHP Director explained: "*We saw that when rural hospitals made changes to fit their needs, things improved. We had adjusted our approach to not only keep the rules strict where it mattered like security, but also to help and encourage these hospitals to make changes that worked for them. For example, we offered support and even rewards for rural hospitals that developed new ways to use technology that still met our main goals*."

The transition from an "either-or" to a "both-and" approach at rural hospitals also significantly influenced how healthcare professionals interacted with the CHP. They became active participants in the scaling process, participating more in decision-making and contributing their on-the-ground insights into how systems and processes could be improved. They attended workshops and training sessions to share best practices, learned from others' adaptations, and collectively brainstormed solutions to new challenges. "*We identified that the standardized appointment scheduling system was not fitting well with rural patients' agricultural work schedules. During our last workshop, I was able to raise this issue and proposed an adjustment to the teleconsultation scheduling to allow more flexible time slots. We implemented a pilot program that adjusted consultation times to early mornings and late evenings, which significantly increased patient attendance and satisfaction. It was rewarding to see our specific local needs influenced the broader system changes and improving our service delivery*" (doctor, rural hospital). Rural hospitals began customizing IT protocols to better align with their specific operational realities. For instance, they developed a customized scheduling spreadsheet that aligned online consultation slots more closely with the availability of healthcare professionals and patients.

While these local adaptations provided crucial benefits, they often led to disagreements and conflicts with the centralized systems of the CHP (and urban hospitals), particularly when customized solutions deviated from established protocols. Overall, the demand for CHP services fluctuated (Figure 4) with moderate usage at the outset, followed by a peak in early 2016 and then a period of stabilization. The overall trend suggests a gradual but steady increase in the adoption of online consultation services among rural hospitals.

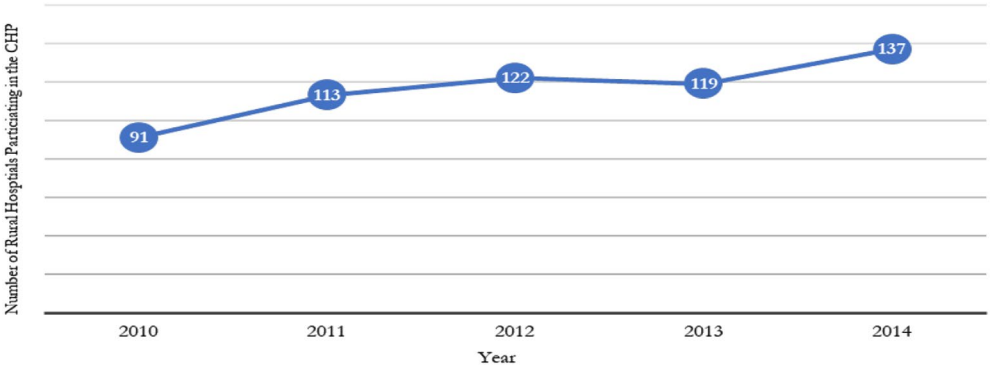


FIGURE 3 | The number of rural hospitals participating in the CHP (2010–2014).

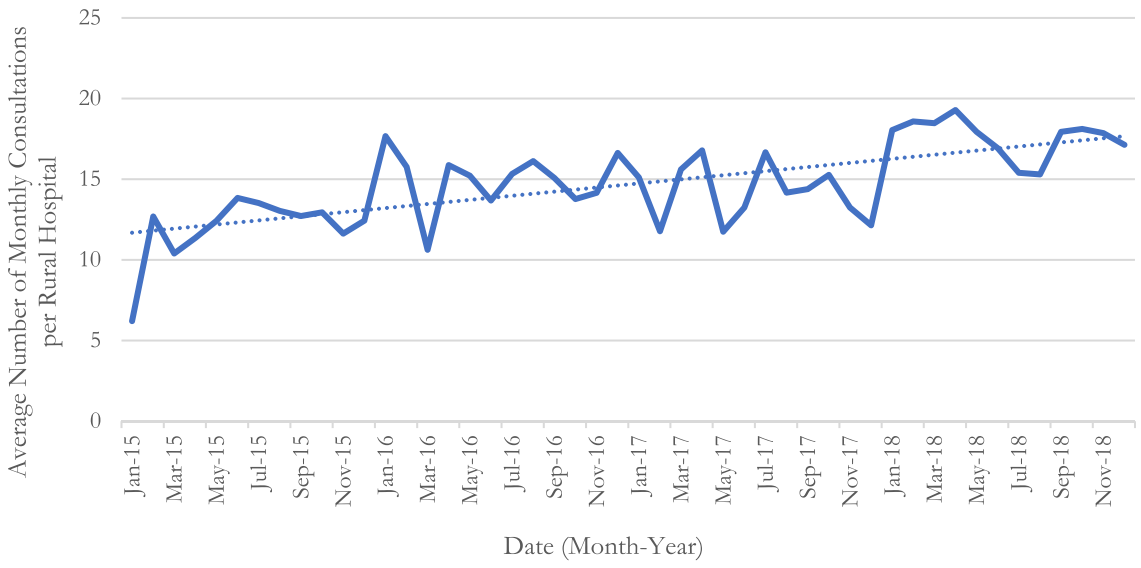


FIGURE 4 | The average number of monthly online consultations requested per rural hospital during the second phase of the digital scaling process (2015–2018).

4.2.3 | Management Responses to Performing Tension in the Continuous Improvement and Innovation Phase

During the final phase of the digital scaling process, we found that rural hospitals, constrained by limited financial resources and workforce shortages, faced significant challenges in fully adopting new technologies. They had to constantly negotiate between the need for cost-efficiency and the pressure to invest in advanced technologies to keep pace with evolving healthcare demands. To manage these challenges and address performance tensions, they implemented a modularization strategy. Specifically, rural hospitals combined the selective adoption of advanced technologies with essential system maintenance. This approach enabled them to effectively address over 200 system-related issues (events) identified through system log reporting data (Supporting Information I). These events were classified by the rural hospitals into modules associated with: (i) system functionality; (ii) technical support; (iii) service optimization; and (iv) quality and compliance management (Table 1). Each module catered to a particular aspect of online consultation services.

Table 1 details the modularization strategy that rural hospitals employed to address performing tension, categorizing each module type and demonstrating how system events were resolved through advanced technologies or system maintenance. We found that the "technical support" module utilized advanced technologies to resolve the vast majority (62) of its 75 recorded issues, such as system crashes and camera malfunctions. The "quality and compliance management" module ensured adherence to procedural, confidentiality, and quality control standards. Out of 20 related events in this area, advanced technologies were able to address 14 (e.g., improving the speed of triage management systems), with the remaining six required maintenance interventions (e.g., updating SMS inquiry systems). The "system functionality" and "service optimization" modules mainly emphasized maintenance as the means of resolution rather than adopting advanced technology. This approach underlined a commitment to maintaining the stability of the CHP system and continuously improving its existing functionality without extensive overhauls. Thus, the system remained stable and reliable, which was crucial for the seamless delivery of its online consultation services.

TABLE 1 | Rural hospitals' modularization strategy to address performing tensions.

Module type	Description	Total events recorded	Modularization strategy performed by rural hospitals	
			Resolved by adopting advanced technologies	Resolved through system maintenance
System functionality	Manages all aspects of system functionality, including software updates, the addition of new features, and improvements to the user interface to enhance overall system performance and user experience	54 (26.60% of all events)	**Implemented in 7 events** to resolve issues [e.g., add multidisciplinary consultation function (Event ID 197)]	**Applied in 47 events** to resolve issues [e.g., automatic triage: Delete all; suggest making it a configurable option in the dictionary for direct freezing (Event ID 3) and after scheduling, the queue displays the information of patients and experts (Event ID 8)]
Technical support	Addresses technical glitches such as system crashes, camera unresponsiveness, or memory overload issues that impact the user experience	75 (36.95%)	**Used for 62 events** to resolve issues [e.g., service memory causes crash (Event ID 182) and lag in opening the high-speed camera (Event ID 191)]	**Necessary in 13 events** (e.g., when the meeting starts and ends, an overlay prompts, blocking the next mouse operation [Event ID 162) and Canceled consultations still require data retention (Event ID 136)]
Service optimization	Focuses on improving the operational efficiency of service delivery, including scheduling integration and admin and IT support	54 (26.60%)	**Implemented in 35 events** to resolve issues [e.g., insert flexible consultation rooms in the triage interface (Event ID 42)]	**Applied in 19 events** to resolve issues [e.g., add undetermined level to hospital grading categories (Event ID 57)]
Quality and compliance management	Ensures that all operations adhere to the necessary procedural, confidentiality, and quality control standards	20 (9.85%)	**Implemented in 14 events** to resolve issues [e.g., during triage management, the expert search function is too slow for all queries (*Event ID 201*)]	**Applied in 6 events** to resolve issues [e.g., add a menu to the operational analysis management for short message inquiry, which is used to query sent SMS notifications (Event ID 101)]

The balanced approach in which technological advancement addressed complex issues, while regular maintenance ensured system integrity and operational efficiency, exemplified a "both-and" management response. This approach has three advantages. First, by breaking down the online consultation service into distinct modules, each aspect of the service could be specifically tailored to meet the unique needs and challenges of different rural hospital environments. A managing director (rural hospital) explained the decision to adopt this modularization approach: "*We had seen first-hand the importance of technology in extending our reach and improving care, but a one-size-fits-all solution just did not work in our diverse settings. By breaking down the CHP into specific, manageable modules, we could tailor our services to exactly what was needed. This approach did not just solve our current issues; it set us up to adapt and expand as technology and patient needs evolve.*"

The second advantage of the approach was that modularization enabled quicker identification and resolution of specific issues. When problems were confined to specific modules, they could be addressed more efficiently, without disrupting the entire system. An IT Director (rural hospital) reported that: *"One of our critical challenges was the lagging video feeds during online consultations, especially with [the] high-speed cameras essential for detailed medical assessments. With the introduction of 5G technology, we saw a remarkable improvement."* The third advantage was that modularization encouraged more active participation from rural hospitals in the scaling process. As rural hospitals identified areas for improvement within specific modules, targeted feedback was provided, which could be more quickly acted upon. A managing director (rural hospital) explained: *"Whenever we spotted something in the system that could be better, we reported it right away. This way, changes could be made quickly and where needed. It was great because it felt like we were directly shaping the scaling process of the CHP."*

Not all rural hospitals, however, moved in the same direction. Some resisted the adoption of new technologies, often driven by stringent budget constraints that made it financially infeasible to do otherwise. A managing director (rural hospital) commented: *"Budget constraints were a real barrier for us. We saw the advantages these new technologies could offer, but the financial aspect was daunting. It was challenging to commit to significant investments when our resources were already stretched thin."* Other rural hospitals exhibited risk-averse behavior, wary of the disruptions new technologies might impose on established workflows. A doctor (rural hospital) noted: "*We were cautious about integrating new technology. The potential for disruption to our established routines, which are crucial for patient care continuity, was something we took very seriously."* Additionally, cultural elements played a part, with some rural hospitals indicating satisfaction with their current system and showing very little interest in embracing change. A doctor (rural hospital) remarked: *"I think the tools we had were sufficient for now. Bringing in new technologies sounded promising, but there was a comfort level with our current system that served our community well, and not everyone was convinced that the changes were worth the effort."*

Overall, from early 2019, the average number of online consultations per rural hospital slightly declined due to challenges with new technology integration and service protocol adjustments (Figure 5). However, from mid-2021 onwards, a noticeable upward trend in the number of online consultations was observed, with the average number of online consultations per rural hospital increasing nearly threefold between April 2021 and October 2022. This significant growth reflects the successful digital scaling process of online consultation. However, the influence of COVID-19 restrictions, such as travel and contact curbs, may have partially contributed to this increase. For instance, the Henan province experienced temporary lockdowns during early 2022 due to COVID-19 outbreaks, but these restrictions were largely lifted by late January and early February 2022. Provincial authorities explicitly emphasized restoring patient mobility and healthcare access by late January 2022 (Reuters 2022). Notably, the upward trend in online consultations persisted steadily throughout 2022, even after these travel and contact curbs were

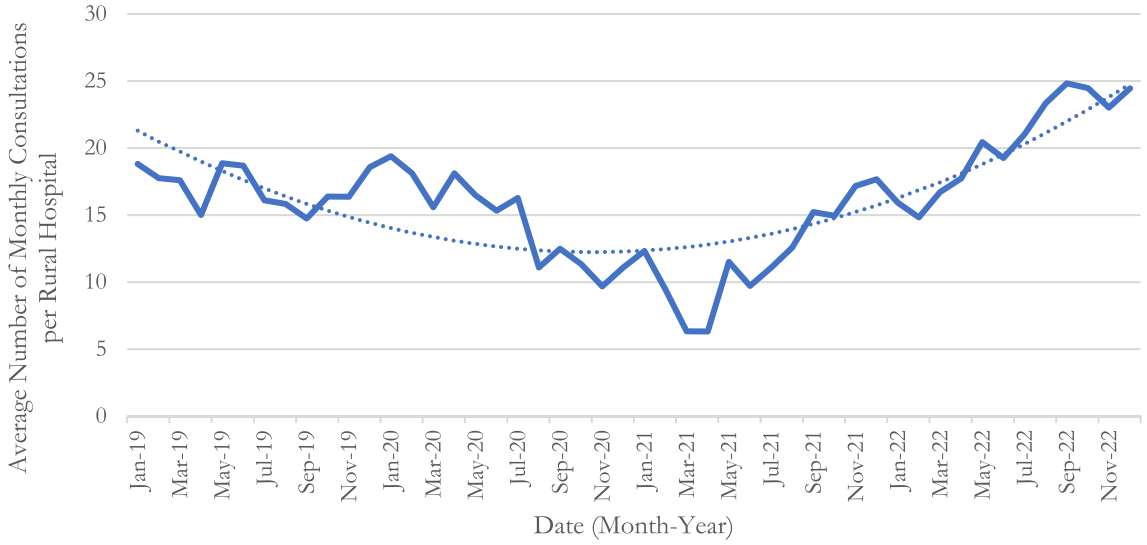


FIGURE 5 | Average number of monthly online consultations per rural hospital in the final phase of the digital scaling process (2019–2022).

relaxed, indicating sustained demand independent of temporary pandemic-related measures.

Additionally, the CHP primarily focused on consultations related to acute and severe medical conditions rather than managing COVID-19 cases directly. During the pandemic, a separate telehealth pathway was established for COVID-19-related consultations. To ensure analytical validity, consultation volume data were carefully reviewed, manually identifying and excluding consultations explicitly related to COVID-19. These cases represented only a minor proportion of the dataset and typically involved severe complications associated with COVID-19, thus having a negligible impact on the overall consultation trends presented in Figure 5.

In summary, at the end of the scaling process, the CHP had significantly contributed to a more equitable distribution of high-quality healthcare resources and access to healthcare services across urban and rural areas. The CHP Director noted: "*This effort [scaling process] has hugely energized grassroots telehealth services [in rural hospitals], creating a robust network that safeguards public health and contributes to the ambitious goals of the Healthy China Initiative*." This reflected how the successful digital scaling of a CHP not only met its initial objectives but also set the foundation for ongoing enhancements in addressing healthcare inequality. Table 2 summarizes insights regarding paradoxical tensions and associated management responses during the scaling process.

TABLE 2 | Summary of paradoxical tensions and management responses in the digital scaling process.

Key insights	Phase 1—Digital foundation building	Phase 2—System integration and governance	Phase 3—Continuous improvement and innovation
Salient tensions	Belonging tension (Embracing CHP integration vs. Maintaining local identity)	Organizing tension (Standardization vs. Local adaptation)	Performing tension (Optimizing existing operations vs. Implementing advanced technological solutions)
Triggers of tensions	Resistance among rural hospitals and healthcare professionals who identify strongly with their existing operations	Compliance and adaptability challenges across urban hospitals, rural hospitals and healthcare professionals	Operational challenges and the urgent need for improvement and innovation to enhance service quality and patient care
Management response for the top 10% high-engagement rural hospitals	• Adopted the "*both-and*" approach, leveraging the benefits of the CHP while working collaboratively to meet centralized standards • Participated in joint initiatives, shared resources, and adhered to CHP policies, which fostered a sense of collective effort and community	• Adopted the "*both-and*" approach, enforcing crucial IT policies while supporting local adaptations • Willingness to receive technical assistance and resources from specialized hospitals to enhance compliance	• Adopted the "*both-and*" approach by implementing modularization strategy • Proactively embraced technological innovation and at the same time, optimized existing operation of online consultation
Management response for the bottom 10% low-engagement rural hospitals	• Adopted the "*either-or*" approach, pursuing own benefits and exhibiting ceremonial conformity • Slow to integrate operational changes or fully embrace collaborative practices, often citing autonomy and data security concerns	• Adopted the "*either-or*" approach, continued ongoing conflicts with centralized IT policies • Continued challenges in embracing the full scope of CHP protocols owing to limited resources and infrastructure	• Adopted the "*either-or*" approach by supporting the optimization of existing operations • Resistant to change owing to budget constraints, risk aversion, or satisfaction with current systems; struggled to integrate new technologies and maintain financial sustainability
Digital scaling performance	Before 2013, the management response of the urban hospitals focused on centralized control and did not fully meet the local needs of rural hospitals. In 2014, the strategy shifted to a more balanced approach, increasing its appeal and leading to a rise of more than 15% in rural hospital participation compared to 2013 (Figure 3).	A significant increase (over 170% from early 2015 to late 2018) in the average number of online consultations per rural hospital. This reflected the gradual acceptance and integration of online consultation services among rural hospitals (Figure 4).	Early 2019 saw a slight decline in online consultations per rural hospital due to challenges with integrating new technologies. From mid-2021, however, a noticeable upward trend in usage was observed, with the average number of online consultations per rural hospital increasing by nearly 300% (from April 2021 to October 2022; Figure 5).

5 | Discussion

In this study, we examine the digital scaling process of a CHP, emphasizing scaling online consultations in rural hospitals. This exploration is pivotal to eliminating the geographical disparities in healthcare service access and quality between rural and urban areas. Building on paradox theory, we theorize and empirically evidence the paradoxical tensions associated with the scaling process. Further, we uncover the management responses made by rural hospitals, typically operating in a resource-constrained environment, to deal with the paradoxical tensions that emerge across different organizational entities.

5.1 | Theoretical Contributions

5.1.1 | Multi-Entity and Temporal Nature of Paradoxical Tensions

While prior OTM studies have stressed the importance of the paradoxical tensions that manifest across different levels of analysis (e.g., Lewis and Smith 2022; Wei et al. 2022), extant literature offers limited insights into the specific types of tension and their multi-entity characteristics that may impact the digital scaling process (Agarwal et al. 2022). Moreover, only a few studies have explored how different types of paradoxical tensions manifest across multiple entities (such as organizations and individuals) (e.g., Andriopoulos and Lewis 2009; Wei et al. 2022). Prior studies have largely overlooked the tensions that manifest in multi-entity platforms where entities interact non-hierarchically (Roesler et al. 2023). An exception is the study by Wei et al. (2022), which investigates how solution providers manage paradoxical tensions in platform-based modular solution networks in the private sector. Their findings show that tensions were not isolated but were interconnected across networks, firms, and modules. Specifically, performing tension manifested within the overall networks, and organizing tension occurred within individual solution providers. In contrast, our study of a CHP—a complex, multi-entity system—empirically demonstrates that, during each phase of the digital scaling process, a single, specific type of tension prevails across all three entities (urban hospitals, rural hospitals, and healthcare professionals).

As such, our findings challenge prevailing expectations (e.g., Fairhurst et al. 2016; Lüscher and Lewis 2008; Wei et al. 2022) that each entity within a system experiences tension unique to its role or context. Instead, our first contribution demonstrates that highly interconnected systems such as CHPs exhibit a convergence of a type of paradoxical tension. Because all entities operate within the same broader healthcare system and face common systemic constraints and institutional pressures, decisions or changes at one entity may inevitably affect others, leading to a similar salient tension experienced by each entity. For instance, the belonging tension manifested when central mandates for standardization conflicted with the localized needs and identities of rural hospitals and healthcare professionals during the CHP's digital foundation phase.

Although a similar underlying tension was observed across the three entities, a distinct type of paradoxical tension manifested as most prominent at each phase of the digital scaling process. In other words, while all entities experienced the same type of tension, its primary manifestation shifted over time as the digital scaling process evolved. For example, in the initial digital foundation building phase, one type of tension may prevail, whereas in subsequent phases, such as "system integration and governance" and "continuous improvement and innovation," a different type becomes most prominent. Although previous studies (e.g., Agarwal et al. 2022; Wei et al. 2022) have hinted at the idea that paradoxical tensions can evolve over time, none have explicitly examined how this evolution occurs across multiple entities and phases. For instance, Schad et al. (2016) suggest that paradoxical tensions might evolve, yet they did not explore this process across multiple entities. Our findings reinforce and extend these ideas by demonstrating that the salient type of paradoxical tension changes during the digital scaling process. This detailed account of tension evolution contributes to the paradox theory literature and aligns with recent calls for research on the temporal nature of tensions (e.g., Bednarek and Smith 2024).

5.1.2 | Managing Paradoxical Tensions Across the Digital Scaling Process

Our study addresses a critical gap by offering insights into managing paradoxical tensions that manifest across entities over time (Bednarek and Smith 2024; Lewis and Smith 2022; Schad and Bansal 2018). We are particularly interested in how rural hospitals, operating in a resource-constrained environment, manage paradoxical tensions that emerge across different entities (urban hospitals, rural hospitals, and healthcare professionals) during the digital scaling process of a CHP—a yet underexplored research setting. Our study's setting is particularly significant given the unique challenges faced by rural hospitals operating in a resource-constrained environment (Guo et al. 2022; Tong et al. 2022) characterized by limited access to financial and healthcare resources, skilled personnel, and technological infrastructure.

In the "digital foundation building" phase, we found that organizations face "belonging tension" as they attempted to balance local identity and network integration. To manage the tension successfully, organizations adopted a "both-and" approach, aligning with the paradox theory's emphasis on embracing contradictory demands simultaneously (Lewis and Smith 2022; Smith and Lewis 2011). Specifically, our empirical findings illustrated that rural hospitals engaged in collaborative policy-making activities such as structured dialogues and joint strategy meetings with urban hospitals and the CHP director. These collaborative interactions provided rural hospitals with opportunities to articulate their unique local requirements and resource limitations while developing strategies that aligned closely with CHP standards. Consequently, rural hospitals could leverage centralized resources (e.g., opportunities for joint procurement initiatives, shared training, and knowledge transfer from urban specialists), effectively addressing their resource constraints without compromising their distinct local identity or autonomy.

In the "system integration and governance" phase, we found a distinct manifestation of "organizing tension" as organizations navigate the complex interplay between standardization and

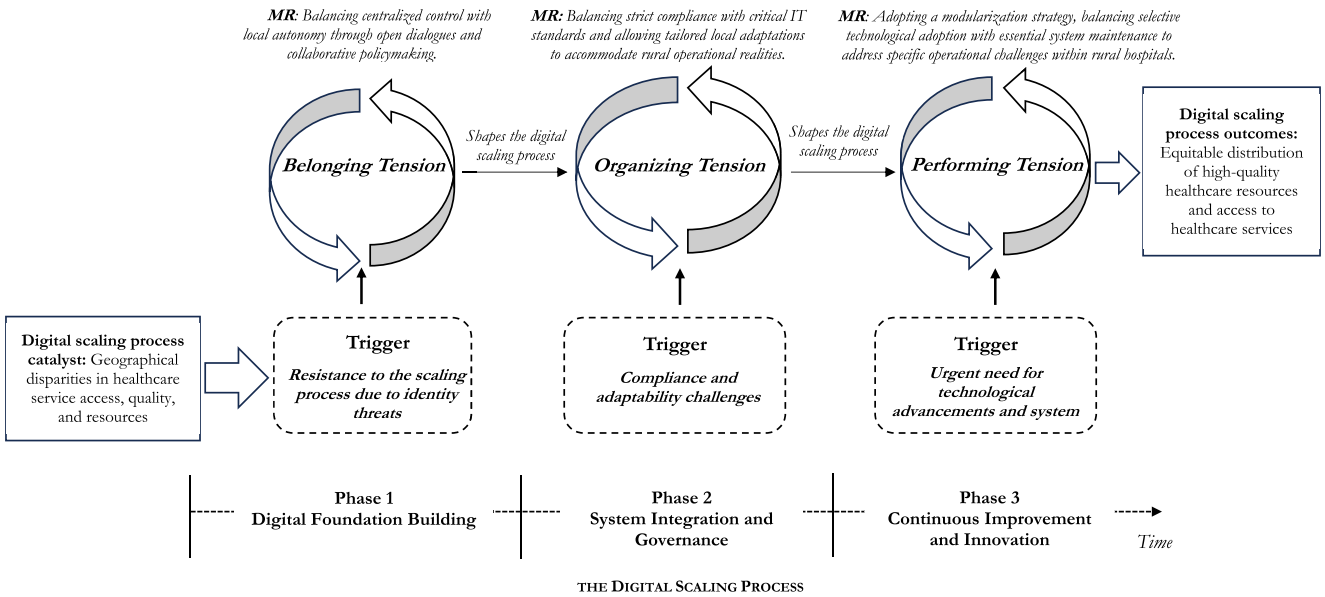


FIGURE 6 | A process model of the digital scaling process—Salient tensions and management responses [MR = Management response from rural hospitals; ↑ indicates the trigger for the emergence of a particular type of tension, emerging at one of the entities in the healthcare system (e.g., belonging tension in urban hospitals during phase 1)].

adaptation. This phase highlighted how the "both-and" approach evolved to address more operational challenges. Organizations that scaled up successfully adopted a nuanced form of the "both-and" approach by making flexible adjustments within a standardized framework (Jarzabkowski et al. 2013). Specifically, they prioritized investments in critical areas of compliance while selectively customizing non-essential elements to fit their local operational contexts and resource limitations (Pache and Santos 2013).

Finally, in the "continuous improvement and innovation" phase, our findings revealed a pronounced performing tension as organizations strove to simultaneously optimize current operations and advance technologically. In navigating this paradox, more effective organizations adopted a modularization strategy, exemplifying a "both-and" approach (Andriopoulos and Lewis 2009). Unlike standardization, which typically involves applying uniform solutions and policies to improve overall healthcare systems (Catena et al. 2020), modularization, as conceptualized in our study, refers to the systematic decomposition of operational challenges into clearly defined and manageable modules. These modules can be independently upgraded or improved, enabling simultaneous technological advancement and operational stability. Previous IS literature (e.g., Lindgren et al. 2021) examined modularization within the context of vertical technology standardization, where standards are developed and implemented across hierarchical levels of an industry. In such vertically structured environments, modularization often involves segmenting comprehensive technical standards into distinct transaction modules (e.g., order management and resource tracking) to coordinate diverse actors with different roles and power positions (e.g., IT vendors, manufacturers, supplier, and customers regulatory bodies). Our study broadened this perspective by evidencing how modularization can also function effectively in a non-hierarchical setting, where entities such as rural and urban hospitals collaborate without a clear hierarchical structure. In our resource-constrained healthcare setting, we demonstrated that modularization can be pragmatically implemented by categorizing operational issues into distinct service modules (e.g., technical support, system functionality, and compliance management). This strategy helped rural hospitals to manage performing tension, balancing continuous improvement and innovation, despite lacking centralized authority and facing significant resource limitations. By enabling these organizations to prioritize, adapt, and refine specific components of the CHP, modularization emerged as a particularly valuable approach for scaling the CHP.

We present a process model (Figure 6) that illustrates how, although the underlying paradoxical tensions remain consistent across entities due to their interconnectedness within the CHP, they are unique to each phase of the digital scaling process. This phase-specific manifestation of tension necessitates a tailored set of management responses. We chose to focus our study on rural hospitals to uncover how they manage complex paradoxical tensions that emerge across multiple organizational entities within a resource-constrained environment. This investigation not only highlights the nature of emerging paradoxical tensions throughout the digital scaling process but also emphasizes the varied management responses across different phases. Particularly, we examine the distinct responses from the high- and low-engagement rural hospitals, which provide a comprehensive view of effective versus less effective responses in handling these tensions. This approach sheds light on critical, yet underexplored, aspects of paradox theory and digital scaling in a resource-limited environment where tensions must be managed across interconnected entities (Roesler et al. 2023; Tatarinov et al. 2023), offering valuable insights for managers and organizations striving to scale digital initiatives successfully despite such constraints.

5.2 | Boundary Conditions and Further Research

Although our study focused on the digital scaling process of a CHP that provides a variety of telehealth services, the insights gained are applicable to various digital health platforms and

settings. Future research should extend these findings to different clinical scenarios, particularly those involving extensive long-term management and care coordination, such as chronic disease management or preventive care, because this could significantly influence the adoption of CHPs. Furthermore, since multiple CHPs can coexist in the same region or country (Chouvarda et al. 2019), our investigation of a single CHP's scaling process highlights the need for future studies to examine the coopetition among such platforms. Researchers could explore how CHPs handle integration and differentiation both internally and in relation to one another, investigating how they cooperate and compete simultaneously (e.g., Taubeneder et al. 2024).

The CHP we investigated operates solely in China. Broader institutional and legal environments, especially for platforms operating internationally, may introduce additional challenges due to cross-cultural considerations (Reuber et al. 2021; Roehrich et al. 2025). For example, differences in regulations and national cultures may create other challenges that CHPs (and their member organizations) must address. This is particularly relevant for CHPs seeking to scale up operations beyond their initial geographical boundary. Understanding the interplay between local/national regulations, cultural differences, and the evolving demands for digital health services is crucial. Specifically, future studies could explore the strategies that cross-border CHPs employ to ensure compliance with diverse regulatory frameworks while also meeting the expectations and preferences of a culturally diverse user base. Likewise, while certain features of different healthcare systems (in different countries) may be similar/the same (e.g., the need to digitalize a range of healthcare services to address geographical disparities), others (e.g., funding mechanisms and governance) may vary between different countries and healthcare systems. We recommend more research to test our insights in settings with other characteristics.

Lastly, we acknowledge that our analysis primarily examined how resource constraints influence engagement patterns, but we recognize the potential for reverse causality in this relationship. While rural hospitals demonstrating higher engagement did receive additional support, this support was largely limited to recognition awards and invitations to professional forums rather than substantive operational resources. The recognition provided symbolic value and networking opportunities, but it did not translate into increased financial budgets, additional staffing, or enhanced medical infrastructure. Therefore, while these rural hospitals gained prestige and professional visibility, their fundamental resource constraints remained unchanged. This distinction between symbolic support and material resource enhancement is crucial for understanding why our findings focus on resource constraints as determinants of engagement rather than the reverse. Future research could explore how different types of support mechanisms might create varying feedback loops between engagement and resource availability.

5.3 | Practical and Policy Implications

CHPs are emerging as promising solutions for reducing healthcare disparities in resource-constrained environments. The World Health Organization (WHO) and International Telecommunication Union (ITU) emphasize that effective collaboration among multiple entities within a CHP, such as government agencies, urban and rural hospitals, and healthcare professionals, traditionally operating independently, can improve healthcare access and efficiency in rural regions (WHO 2024). The WHO's (2024) guidance serves as a useful starting point for ongoing CHP initiatives such as Be He@lthy, Be Mobile (WHO 2021), and the Zimbabwe Telemedicine Network (Matiashe 2024), all of which aim to connect multiple entities effectively. However, the guidance does not fully address the need for a deep understanding of potential tensions and the development of tailored management responses required for each phase of the digital scaling process.

Our results reveal that paradoxical tensions are specific to each phase of scaling, with a predominant type of tension characterizing each phase, rather than distinct tensions arising across different entities at the same time. This insight underscores the necessity for practitioners and policymakers to coordinate CHP initiatives to develop a phased implementation guidance that is tailored to address the specific tension faced by both urban and rural hospitals and healthcare professionals during a digital scaling phase. When formulating the guidance (Table 3), it is essential to consider the interconnected impacts of their policies on all participating entities in a CHP, steering clear of one-size-fits-all solutions or piecemeal approaches targeted at an individual entity only.

5.3.1 | Phase 1: Digital Foundation Building

To reduce effectively belonging tension among rural hospitals and healthcare professionals, CHPs should explicitly adopt a collaborative policymaking strategy early on, replacing overly rigid contractual enforcement with open dialogues and joint decision-making forums. For example, organizing regular collaborative workshops provides a constructive platform where healthcare professionals from urban and rural areas can jointly address integration challenges, identify local resource needs, and tailor CHP standards accordingly. For rural hospital managers, it is crucial to participate actively in collaborative workshops and to voice local constraints and resource requirements. Rural hospitals that openly communicated their specific challenges (e.g., limited IT infrastructure and administrative capacity constraints) during collaborative dialogues were better supported in terms of resources, such as joint procurement opportunities and tailored training sessions. Managers should also clearly articulate how standardized guidelines can be adapted feasibly to their local contexts, promoting cooperative negotiation rather than passive resistance. Rural healthcare professionals should also clearly and frequently communicate their clinical needs and challenges, actively participating in joint forums to ensure that clinical protocols integrate local expertise effectively. Our empirical findings emphasized that rural doctors experienced significant identity tensions when urban specialists undervalued local clinical judgment. Effectively championing a position during these collaborative dialogues helps ensure that protocols respect rural clinical contexts and that the digital foundation builds upon rather than erodes local clinical capabilities.

Policymakers must recognize the critical need for adequate infrastructure and capacity-building support tailored for rural

TABLE 3 | Actionable recommendations for managing paradoxical tensions across the three phases of the digital scaling process.

Entity	Phases of the digital scaling process		
	Digital foundation building	**System integration and governance**	**Continuous improvement and innovation**
Urban hospitals	• Shift from rigid enforcement to collaborative policymaking. • Organize regular workshops and joint forums to address local integration issues and tailor standards.	• Clearly distinguish core standards (e.g., data security) from flexible local practices. • Provide technical support, incentives, and knowledge-sharing forums. • Regularly review and adjust performance targets based on rural feedback.	• Champion a modular platform architecture enabling incremental improvements and innovations. • Encourage and reward rural hospitals actively identifying and solving module-specific problems, fostering proactive rural participation.
Rural hospitals	• Actively participate in collaborative workshops and clearly voice local constraints. • Clearly articulate local resource needs to secure targeted support (e.g., opportunities for joint procurement and tailored training).	• Proactively modify workflows and processes to meet telehealth targets without overburdening staff. • Collaborate with peers through forums, workshops, and informal groups to share and standardize effective practices.	• Persist in the modularization strategy, selectively introducing advanced technologies where significant improvements in patient outcomes are expected. • Prioritize routine maintenance and incremental enhancements in less critical areas to maintain overall system stability and reliability.
Rural healthcare professionals	• Proactively communicate clinical needs and expertise during collaborative dialogues. • Advocate constructively for local clinical judgment to shape flexible telehealth protocols.	• Engage actively in telehealth skill development training. • Pursue peer learning to enhance practical troubleshooting and platform efficiency.	• Enhance CHP scalability by promptly reporting module-specific problems, creating a positive feedback loop of continuous improvement, higher user satisfaction, and increased engagement.
Policymakers	• Prioritize investment in rural IT infrastructure and capacity building. • Develop flexible guidelines within clearly defined national standards. • Formally institutionalize multi-stakeholder collaboration from the outset of digital health initiatives.	• Formalize delineation of non-negotiable standards and adaptable practices through rural stakeholder input. • Institutionalize rural representation in governance via joint advisory committees and structured feedback channels.	• Invest in rural digital infrastructure and innovation-enabling platforms by expanding proven funding programs and launching new pilot projects in under-served regions. • Implement comprehensive training and capacity-building programs for rural healthcare professionals.

hospitals. This involves prioritizing the government's targeted investments in rural IT infrastructure, allocating dedicated resources for staff training, and formulating guidelines that offer flexibility within clear standards. Policymakers should also formally institutionalize collaborative policymaking platforms, mandating that major digital healthcare initiatives include structured multi-entity engagements from the outset, thus systematically embedding local responsiveness within national standards. These recommendations align with the objectives outlined in the National Health Commission's Rural Health Policy (2024), emphasizing upgrading infrastructure, developing healthcare professionals in rural areas, and enhancing healthcare services to ensure convenient and affordable access to medical services in rural regions by 2030.

5.3.2 | Phase 2: System Integration and Governance

To address the challenge of balancing standardized protocols with the need for local adaptation in rural healthcare settings, the CHP should clearly distinguish non-negotiable core standards (e.g., data security, patient privacy, and interoperability protocols) from areas where local flexibility is acceptable (e.g., scheduling practices and workflow adjustments). By doing so, rural hospitals can confidently adapt non-critical processes while still adhering to essential system-wide requirements. The CHP should further provide technical support and incentives to rural hospitals and facilitate knowledge-sharing forums that help build the digital literacy and skills needed to comply with IT protocols and enable the exchange of best practices and collaborative problem-solving. The CHP may regularly review

performance targets and compliance metrics in light of on-the-ground feedback from rural hospitals. If strict targets (e.g., 200 consultations per month) are consistently missed due to legitimate local constraints, the CHP should consider adjusting such goals and/or providing additional support to meet them.

Rural hospital managers need to proactively modify workflows and processes to meet telehealth targets under local limitations. This can include creative scheduling (as seen in the example of offering late-evening, or early-morning, teleconsultation slots to accommodate working patients), task-shifting among staff, or batching teleconsultations on days when specialist support is available. The goal is to meet, or exceed, CHP's performance metrics without overburdening staff or compromising patient care. Additionally, rural hospital managers should collaborate with their peers (facilitated by the CHP through knowledge-sharing forums) to share best practices and standardize effective adaptations. This could involve periodic workshops, email or chat groups among managers across the organizations in a CHP to discuss what is (and is not) working. Such peer learning can reduce the need to "reinvent the wheel" and lead to a more unified quality of telehealth services across regions. Rural healthcare professionals should take advantage of any training sessions, workshops, and/or educational resources offered by CHP, or their own rural hospital, to improve telehealth skills. They can also pursue peer learning, such as teaching each other to use the platform more efficiently and/or helping each other to troubleshoot common platform issues (e.g., how to quickly convert a file format, or steps to reconnect after a dropped video call). Since a "both-and" governance strategy was suggested to implement, policymakers should delineate which protocols are non-negotiable core standards (e.g., data privacy, security encryption, and clinical quality guidelines) and where adaptation is encouraged (e.g., scheduling practices, non-critical workflow steps). This can be formalized by co-creating guidelines with input from rural hospitals and updating compliance audits to accommodate approved local customizations. Policymakers should also institutionalize rural representation in telehealth program governance by setting up joint advisory committees that include rural hospital managers, healthcare professionals, and IT staff alongside urban administrators. Frontline feedback loops must be formalized via, for example, creating a structured channel (such as an online portal) for rural hospitals to suggest improvements and/or report challenges.

5.3.3 | Phase 3: Continuous Improvement and Innovation

A modularization strategy was effectively used by rural hospitals to navigate their performance tension, enabling selective integration of advanced technologies alongside ongoing system maintenance and operational optimization. CHPs should encourage and reward rural hospitals that identify and solve module-specific problems (for detailed examples, see Supporting Information I), promoting active rural participation in continuous platform improvement. Rural hospitals should persist in their modularization strategy, selectively introducing advanced technologies in clinical areas where substantial improvements in patient outcomes are expected. Conversely, routine maintenance and incremental enhancements should be prioritized for less critical areas to ensure overall system stability and reliability. Rural healthcare professionals play a vital role in the modularization process by promptly and accurately identifying and reporting module-specific issues. By providing constructive feedback to the CHP, healthcare professionals can contribute to the digital scale of the CHP, enhancing its effectiveness and usability.

Policymakers should also strengthen and fine-tune the policy environment to support the effective scaling of CHPs in rural areas. First, it is crucial to continue investing in the digital infrastructure that underpins continuous improvement and innovation. The government's stated objective of building a "unified, authoritative, interconnected national health information platform" by 2025 (National Health Commission 2022), with full coverage across all public healthcare institutions, provides a clear policy mandate. To advance this goal, policymakers should expand existing funding programs that have demonstrated a positive impact and initiate new pilot projects targeting underserved rural regions. Second, policymakers should implement comprehensive training and capacity-building programs to equip rural healthcare professionals with the digital skills necessary to engage with system updates and new technologies. These programs should go beyond basic IT training to include hands-on instruction in teleconsultation workflows, remote monitoring tools, and data-driven clinical decision support systems. Offering such training in flexible formats (e.g., on-site workshops, tele-mentoring, and mobile learning platforms) can also help ensure accessibility for rural healthcare professionals with demanding schedules.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Data S1:** Supporting Information.