

IMPACT OF DIGITAL TECHNOLOGY AND DIGITAL USAGE THROUGH DIGITAL INFRASTRUCTURE ON THE COMPETITIVE ADVANTAGE OF HOSPITALS

Dina Erdiana^{1,2*}, Felina C. Young¹, Hector Jhon T. Manaligod³

¹DBA Programme, Philippines Women's University, Manila, Philippines

²Universitas Prima Nusantara, Bukittinggi, Indonesia

³De La Salle, Philippines

Abstract. Hospitals in Bukittinggi City face increasing competition and rising patient expectations, requiring effective digital transformation to sustain competitive advantage. This study aims to analyze the impact of digital technology, digital usage, and digital infrastructure on the competitive advantage of hospitals in Bukittinggi, West Sumatra, Indonesia. A quantitative research approach was employed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) to examine the relationships among variables. Data were collected from hospital employees who actively use digital systems in operational activities. The findings indicate that digital technology and digital usage significantly influence the development of digital infrastructure. Furthermore, digital infrastructure plays a critical role in strengthening hospital competitive advantage through improved system reliability, data security, and service efficiency. However, digital usage alone does not directly enhance competitiveness without adequate infrastructure support. The study concludes that successful digital transformation in hospitals requires integrated digital strategies that combine technological adoption, infrastructure readiness, and human resource capability. Therefore, hospitals are recommended to strengthen digital infrastructure, enhance staff digital literacy through continuous training, and implement integrated digital systems to improve service quality, operational efficiency, and long-term competitiveness.

1 Introduction

The era of digital transformation presents both unprecedented opportunities and complex challenges for healthcare institutions globally. As critical providers of public health services, hospitals are increasingly required to adopt innovative digital

* Corresponding author: 2023t1094@pwu.edu.ph

technologies to enhance operational efficiency, improve service quality, and ultimately achieve sustainable competitive advantage. In Indonesia, especially in regional cities such as Bukittinggi, West Sumatra, adopting and integrating digital technologies into hospital systems has become a strategic imperative.

The Indonesian Ministry of Health's National Health Digital Transformation policy, launched in 2022, underscores the government's commitment to fostering a digital health ecosystem characterized by integrated electronic medical records, telemedicine, and real-time data exchange across health facilities. Despite these initiatives, hospitals in Bukittinggi face several obstacles that hinder the realization of the full benefits of digital transformation. Preliminary observations and empirical evidence indicate that the region's hospitals suffer from inadequate technological infrastructure, fragmented and non-integrated digital systems, limited digital literacy among health workers, and organizational resistance to change.

These obstacles contribute to suboptimal service delivery, inaccurate data management, and reduced patient satisfaction, collectively impairing hospitals' ability to gain a competitive edge in an increasingly competitive healthcare market. Digital infrastructure (comprising reliable internet networks, robust hardware, cybersecurity frameworks, and competent human resources) serves as the backbone essential for supporting sophisticated digital health applications such as hospital information systems (SIMRS), electronic health records (EHR), telemedicine services, and cloud computing platforms. However, effective use of these technological advancements depends not only on their availability but also on their integration into, and adoption within, hospital workflows and cultures.

This study aims to fill a gap in local research by examining how digital technology, its use, and digital infrastructure collectively influence hospitals' competitive advantage in Bukittinggi. Using a rigorous Structural Equation Modeling framework, this research explores the direct and indirect relationships among these factors and hospital competitiveness, measured through innovation, operational efficiency, service quality, and patient satisfaction. By examining these dimensions, the study contributes theoretically by applying and validating the Resource-Based View (RBV) and the Information System Success Model in a regional healthcare context.

Practically, it offers valuable insights and strategic recommendations for hospital managers, policymakers, and stakeholders seeking to drive digital transformation initiatives that are aligned with organizational goals and patient-centered care imperatives. Ultimately, the research underscores that digital transformation in healthcare extends beyond technology deployment to encompass infrastructural readiness, user competency development, and a supportive organizational culture that together sustain competitive advantages in dynamic healthcare environments.

2 Theoretical Framework

This research draws on three main theoretical perspectives: Digital Technology Theory, Digital Usage Theory, and Information Technology Infrastructure Theory.

1. Digital Technology Theory emphasizes the role of integrated digital systems (such as Electronic Health Records (EHR), telemedicine, and clinical decision support systems) in enhancing care accuracy and workflow automation (Laudon & Laudon, 2023; WHO, 2024).
2. Digital Usage Theory focuses on user acceptance, digital literacy, and effective utilization of technology by healthcare workers as critical mediators translating digital investments into performance outcomes (Venkatesh et al., 2023).
3. Information Technology Infrastructure Theory identifies digital infrastructure components (networks, hardware, cybersecurity, and IT governance) as foundational elements that enable smooth digital operations and sustained competitiveness (Yoon & Kim, 2023; Ghobakhloo, 2024). Together, these frameworks underpin hypotheses relating digital technology and usage to infrastructure development, which in turn influences hospital competitive advantage.

3 Research and Discussion

Using SEM-PLS analysis on data collected from several hospitals in Bukittinggi, the study finds:

3.1. Results

The empirical analysis revealed that digital technology usage had a significant and positive effect on digital infrastructure, with a path coefficient of 0.465 (T-Value = 5.530). Similarly, digital user readiness significantly influenced digital infrastructure, though with a more moderate coefficient of 0.243 (T-Value = 2.693). Digital infrastructure emerged as the strongest determinant of competitive advantage, exhibiting a substantial positive direct effect (coefficient = 0.437, T-Value = 6.660). Contrary to expectations, digital usage demonstrated a significant but negative direct effect on competitive advantage (coefficient = -0.217). This suggests that without robust infrastructure support, increased technology use may engender operational inefficiencies, administrative complexity, or user frustration. Digital technology itself positively influenced competitive advantage both directly and indirectly via digital infrastructure, confirming that investment in technological systems strengthens the foundational infrastructure essential for competitiveness.

The model's internal consistency and construct validity were supported by high loading values and significant T-statistics, confirming the robustness of the conceptual framework. These results highlight digital infrastructure as the critical mediator between technology-related factors and hospital performance outcomes

3.2. Discussion

The findings underscore the pivotal role of digital infrastructure in operationalizing the benefits of digital technology within healthcare settings. Hospitals in Bukittinggi that

possess stable internet connectivity, modern hardware, integrated and user-friendly management information systems, and stringent data security mechanisms are better positioned to improve service efficiency and patient satisfaction, thereby gaining a competitive advantage.

The negative impact of digital technology usage on competitive advantage without adequate infrastructure indicates that mere adoption of digital tools is insufficient. The digital systems may impose added administrative burdens or workflow disruptions if not adequately supported by reliable infrastructure and digital literacy initiatives. Hence, hospitals must prioritize infrastructural development alongside fostering a digitally competent workforce to realize the strategic value of digital transformation.

Additionally, the findings corroborate the Resource-Based View theory by confirming that physical and human technical resources constitute valuable organizational assets when properly integrated. The study also extends the Information System Success Model by demonstrating how system quality and use lead to organizational benefits only through enabling infrastructures.

This research identifies critical challenges in Bukittinggi hospitals, such as fragmented digital systems, limited integration, resistance to change, and inadequate training. Addressing these issues requires comprehensive digital transformation strategies that include infrastructure enhancement, ongoing staff training, system integration, and a culture that supports innovation.

4 Conclusion

This study concludes that digital infrastructure is the cornerstone for achieving competitive advantage in hospitals undergoing digital transformation in Bukittinggi, West Sumatra. While digital technology and user readiness matter, their benefits are fully realized only when robust infrastructure supports secure, stable, and integrated operations.

Strategic investments in hardware, networking, cybersecurity, and health worker capacity building are imperative. Moreover, hospitals should implement integrated management information systems with user-friendly interfaces to facilitate adoption and reduce resistance. The interplay of these factors improves operational efficiency, enhances service quality, and increases patient satisfaction, core drivers of competitive advantage. Practically, hospital administrators and policymakers must design targeted interventions to develop digital infrastructure and human capabilities in tandem. This approach will enable sustainable digital transformation and ensure hospitals remain competitive amid the evolving healthcare landscape. The study also provides a theoretical framework to guide future research and policy formulation within regional healthcare digitization efforts.

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