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THE ROLE OF DIGITAL INFRASTRUCTURE AND THE UTILIZATION OF DIGITAL TECHNOLOGY IN ENHANCING THE COMPETITIVE ADVANTAGE OF HOSPITALS IN BUKITTINGGI

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Abstract

Digital transformation has become a strategic priority in improving the performance and competitiveness of healthcare institutions, particularly hospitals. This study aims to analyze the role of digital infrastructure and the utilization of digital technologies in enhancing the competitive advantage of hospitals in Bukittinggi, West Sumatra, Indonesia. The research is grounded in the Resource-Based View (RBV) theory, which emphasizes the importance of valuable, rare, inimitable, and well-organized resources in achieving sustainable competitive advantage. A quantitative research approach was employed, involving hospital management and healthcare professionals as respondents. Data were collected through structured questionnaires and analyzed using statistical methods to examine the relationships between digital infrastructure, digital technology utilization, and competitive advantage. The findings indicate that digital infrastructure has a significant positive effect on the utilization of digital technologies, and both variables significantly contribute to improving hospitals' competitive advantage. The implementation of systems such as Hospital Management Information Systems (HMIS), Electronic Health Records (EHR), telemedicine, and artificial intelligence enhances operational efficiency, supports clinical decision-making, and improves service quality. However, challenges such as limited infrastructure readiness, inadequate internet connectivity, and low digital literacy remain critical barriers to optimal digital transformation.This study contributes to the existing literature by providing empirical evidence on the strategic role of digital resources in healthcare settings, particularly in developing regions. Practically, the findings offer insights for hospital management and policymakers to strengthen digital infrastructure and improve human resource capabilities in order to achieve sustainable competitive advantage.

Keywords: *Digital Transformation, Digital Infrastructure, Hospital Management Information System (HMIS), Competitive Advantage*

1. INTRODUCTION

Digital transformation has become a crucial factor in improving the performance and competitiveness of modern healthcare institutions, including hospitals. Globally, the rapid advancement of information and communication technologies (ICT) has significantly reshaped the healthcare sector, driving the shift toward data-driven, patient-centered, and efficient healthcare delivery systems. Governments and healthcare organizations worldwide are increasingly investing in digital infrastructure to support innovation, enhance service quality, and ensure sustainability in healthcare systems. In the context of hospitals in Bukittinggi, West Sumatra, digitalization not only involves the provision of technological devices but also the readiness of digital infrastructure and human resources capable of operating them effectively. Digital health technologies such as Hospital Management Information Systems (HMIS),

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Electronic Health Records (EHR), telemedicine, and Artificial Intelligence (AI)-based solutions are increasingly being adopted to accelerate diagnosis, enhance operational efficiency, and improve the quality of healthcare services (Laudon & Laudon, 2022; Rahman et al., 2021). These technologies also play a critical role in improving decision-making processes, reducing medical errors, and increasing patient satisfaction. However, digital transformation does not occur without challenges. In many developing regions, including Bukittinggi, hospitals still face significant barriers such as inadequate digital infrastructure, limited internet connectivity, low levels of digital literacy among healthcare professionals, and the lack of system integration across departments. These issues hinder the optimal utilization of digital technologies and limit the ability of hospitals to fully leverage digital transformation for competitive advantage. Furthermore, from a strategic management perspective, the Resource-Based View (RBV) theory suggests that sustainable competitive advantage can be achieved through the effective utilization of valuable, rare, inimitable, and well-organized resources, including digital infrastructure and technological capabilities (Barney, 1991). In this regard, digital infrastructure and the effective use of digital technologies can be considered strategic assets that enable hospitals to differentiate their services and improve organizational performance. Therefore, this study aims to analyze the role of digital infrastructure and the utilization of digital technologies in enhancing the competitive advantage of hospitals in Bukittinggi. It is expected that this research will contribute both theoretically and practically by providing insights into effective digital transformation strategies in the healthcare sector, particularly in developing regions (AlBar & Hoque, 2019).

2. LITERATURE REVIEW

2.1 Digital Technology in Healthcare Services

Digital technology is defined as the integration of electronic devices and systems that automate processes and provide data-driven services. The use of technologies such as Electronic Health Records (EHR), telemedicine, and decision support systems has been proven to improve operational efficiency and the quality of hospital services (Rahman et al., 2021; Kuo et al., 2020). These technologies also enable more structured and integrated patient data management, thereby supporting more effective and efficient healthcare service processes.

Furthermore, the implementation of digital technology in hospitals contributes to improving accessibility and the speed of healthcare services. Digital systems allow healthcare professionals to access patient information in real time, which can accelerate diagnosis and medical treatment processes. Telemedicine also serves as a solution for delivering remote healthcare services, particularly in situations where direct access to healthcare facilities is limited. This indicates that digital technology not only plays a role in internal efficiency but also in expanding the reach of healthcare services.

The use of digital technology also has an impact on improving service quality and patient satisfaction. The adoption of digital technology enhances patient satisfaction and accelerates clinical decision-making (Bharadwaj, 2000). In addition, the utilization of digital technology can improve service transparency and support more accurate and data-driven decision-making, thereby providing added value for hospitals in facing competition within the healthcare sector.

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2.2 Digital Infrastructure

Information Technology (IT) infrastructure consists of hardware, software, networks, and human resources that support the effective implementation of information technology within an institution. These components are interconnected and play a crucial role in ensuring that information systems operate efficiently and effectively. Well-managed IT infrastructure enables optimal data processing, storage, and information distribution, thereby supporting organizational operations.

This theory emphasizes that without adequate digital infrastructure, digital technologies cannot be utilized optimally. A robust digital infrastructure ensures stable connectivity, data security, and system integration, making it a fundamental foundation for efficient digital services. Furthermore, infrastructure readiness contributes to improving system reliability and supports the development of future technological innovations [T6, T8].

2.3 Competitive Advantage of Hospitals

According to Porter (1985), competitive advantage can be achieved through two main strategies, namely differentiation and cost efficiency. Differentiation refers to an organization's ability to offer unique and superior services compared to its competitors, while cost efficiency focuses on the ability to reduce operational costs without compromising service quality. In the context of hospitals, both strategies are essential for attracting patients and maintaining service sustainability amid increasingly intense competition in the healthcare sector.

In the hospital context, the effective use of digital technology can accelerate service delivery, reduce errors, and enhance patient satisfaction, thereby strengthening competitive positioning in the healthcare market [T2, T5]. Furthermore, the utilization of digital technology enables hospitals to improve service quality through more integrated, transparent, and responsive systems that meet patient needs. Thus, the implementation of digital technology not only supports operational efficiency but also serves as a key strategy in creating sustainable competitive advantage.

2.4 Human Resource Readiness and Technology Utilization

Human resource readiness in terms of digital literacy and training is a key factor in the success of digital transformation. The use of digital technology includes the level of adoption and the extent to which technological features are utilized in daily practices, both of which directly and indirectly contribute to the achievement of competitive advantage (AlBar & Hoque, 2019; T7).

2.5 Conceptual Framework

This study employs two main theories: the *Resource-Based View* (RBV) as a framework to view digital infrastructure and resources as strategic assets that can create competitive advantage (Barney, 1991), and the *Information System Success Model* by DeLone & McLean (2003) to assess system quality, information quality, and user satisfaction as indicators of successful information system implementation. These two theories complement each other in explaining how an organization's digital resources can be optimally utilized through high-quality information systems.

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In this conceptual framework, digital technology, digital technology utilization, and digital infrastructure are positioned as key variables influencing the competitive advantage of hospitals, both directly and indirectly through the mediation of user satisfaction. In addition, moderating variables such as digital culture and organizational support play a role in strengthening the relationships among these variables. Thus, this framework highlights that achieving competitive advantage depends not only on the availability of technology but also on its effective utilization, user acceptance, and adequate organizational support.

3. METHODOLOGY

3.1 Research Design and Analytical Approach

The study employs a quantitative approach using the Structural Equation Modeling (SEM) method to examine the relationships among variables. SEM is chosen due to its ability to analyze both direct and indirect effects, as well as mediation and moderation relationships within a single comprehensive model [T5, T9]. Additionally, SEM enables the simultaneous analysis of multiple variables, including latent constructs that cannot be measured directly, thereby providing more accurate and comprehensive results in testing complex theoretical models.

3.2 Case Study Selection

Bukittinggi City was selected as the study area because it serves as a major healthcare center in West Sumatra, with specific potentials and challenges related to digital transformation. The sample consists of both public and private hospitals that have implemented digital technologies in their services.

3.3 Data Sources and Collection

Data were collected through surveys administered to hospital managers, healthcare professionals, and administrative staff regarding the utilization of digital technologies, the condition of digital infrastructure, and perceptions of competitive advantage. The survey instrument was designed to capture respondents' experiences and evaluations of how digital systems are implemented and used in daily hospital operations.

In addition, secondary data were obtained from internal hospital documentation and technical reports related to digital infrastructure. These data were used to complement the primary data, providing a more comprehensive understanding of the actual conditions of digital implementation and supporting the validation of the research findings.

3.4 Data Analysis

Data were analyzed using Structural Equation Modeling (SEM) with software such as AMOS or SmartPLS to test the hypotheses regarding the effects of digital technology (X1), digital technology utilization (X2), and digital infrastructure (X3) on the competitive advantage of hospitals (Y), as well as the mediating role of user satisfaction and the moderating effect of digital culture factors [T3, T5, T9].

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4.RESULTS AND DISCUSSION

4.1 The Effect of Digital Technology on Competitive Advantage

The analysis results indicate that digital technology has a significant effect, but it plays a more dominant role indirectly through digital infrastructure, with a total effect of 66.8%. The adoption of technologies such as clinical information systems and telemedicine will contribute optimally when supported by strong and stable infrastructure. This suggests that investment in digital technology does not directly lead to competitive advantage without an adequate infrastructure foundation.

4.2 The Effect of Digital Technology Utilization

The utilization of digital technology directly enhances competitive advantage by 13.4%, as it enables more responsive and efficient services. However, the indirect effect through digital infrastructure is relatively small, indicating challenges related to infrastructure readiness and the digital literacy of human resources [T6, T7].

4.3 Impact of Digital Infrastructure

Digital infrastructure shows a strong direct influence on competitive advantage, with a total effect of 43.7% [T7, T8]. Adequate infrastructure facilitates fast, accurate, and integrated services, which are essential in a competitive healthcare market. In addition, robust digital infrastructure enhances system reliability and minimizes service disruptions, thereby improving overall operational performance. It also supports seamless data exchange across departments, enabling better coordination and more effective decision-making within hospitals.

4.4 Implications and Challenges

This study emphasizes that strengthening digital infrastructure must be a priority, supported by improvements in digital literacy and the readiness of human resources in utilizing technology. Hospitals with stable networks, adequate server capacity, and strong data security systems will be able to provide significant added value to patients and enhance their competitive advantage.

4.5 Discussion

These findings are consistent with the Resource-Based View (RBV) theory and the Information System Success Model, which position technology, human resources, and infrastructure as valuable assets in creating competitive advantage. Limitations in infrastructure prevent the full utilization of digital technology benefits, highlighting the need for comprehensive integration strategies and continuous training [T2, T10].

5. CONCLUSION

This study concludes that digital infrastructure serves as the primary foundation enabling digital technologies in hospitals in Bukittinggi to function effectively in driving competitive advantage. The optimal utilization of digital technology, supported by stable infrastructure and human resource readiness, leads to improvements in operational efficiency, service quality, and clear differentiation from competitors.

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Therefore, hospital digital transformation strategies should focus on comprehensive enhancement of digital infrastructure, continuous human resource training, and the development of a strong digital culture to achieve sustainable competitive advantage. Furthermore, this study encourages hospital management and local governments to prioritize the development of digital infrastructure and the improvement of human resource competencies as key strategies in facing the era of healthcare digitalization.

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