Does Digital Transformation Impact Upper-Middle-Class Hospital Performance Through Business Model Innovation?

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Abstract

Background: This research examines the influence of Digital Transformation (DT) and Resources Integration (RI) on Hospital Performance (HP), with Business Model Innovation (BMI) as a mediating variable. The focus is on upper-middle-class hospitals in Indonesia.

Objective: The objective of the study is to analyze how DT and RI impact HP and to explore the mediating role of BMI in this relationship

Methods: The study employs quantitative methods, collecting data through a 5-point Likert scale questionnaire distributed via Google Forms. Valid responses were gathered from 241 hospitals. The data were analyzed using SmartPLS

Results: The findings reveal that DT does not have a significant direct influence on HP, whereas RI has a significant positive impact on HP. Both DT and RI significantly influence BMI, which in turn significantly affects HP, highlighting its strong mediating role. These results underscore the importance of BMI as a crucial link between DT, RI, and improved hospital performance.

Conclusions: The study concludes that focusing on innovative business models enables hospitals to better leverage digital technologies and integrated resources to enhance their performance. Practically, this research suggests that hospital managers in Indonesia should prioritize developing innovative business models, invest in training and skill development programs, and implement appropriate innovation strategies to improve performance, patient outcomes, and operational efficiency. This study contributes to the literature on hospital management and Digital Transformation, particularly in the Indonesian context, and provides actionable recommendations for leveraging digital advancements and resource integration for superior healthcare delivery.

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Keywords: Digital Transformation, Resources Integration, Business Model Innovation, Business-to-Business, Hospital Performance, Indonesian Upper-Middle-Class Hospital.

Introduction

Background

Using technology to improve business processes and operational efficiency is a key component of Business Model Innovation (BMI). This can have a big impact on business-to-business (B2B) relationships by enhancing customer experience (CRM) and adding value for all stakeholders [1]. The health industry is only one of the many industries that have been significantly impacted by the rapid advancements in digital technology [2]. Digital transformation (DT) has gained recognition as a key tactic for enhancing hospital performance (HP) in recent years, with an emphasis on enhancing overall health services, patient care quality, and operational efficiency. Hospitals are undergoing a digital transformation as a result of the integration of numerous digital tools and technologies, including telemedicine, artificial intelligence (AI), and electronic health records (EHR), to streamline [3].

Even though the potential benefits of Digital Transformation are large, the real impact on Hospital Performance is still not fully understood, especially in developing countries like

Indonesia. BMI has an important role in improving Hospital Performance, especially in the context of business-to-business (B2B) interactions. BMI can significantly alter hospital operations, teamwork, and healthcare services through the use of Digital Transformation (DT) and Resources Integration (RI). This enhances patient satisfaction and service quality in addition to affecting operational efficiency [4].

This study investigates the impact of DT and RI on HP through BMI [5]. The link between HP, RI, and DT is significantly mediated by BMI [6]. It entails reorganizing and revamping company procedures to provide value and obtain a competitive edge [7]. Research on BMI provides valuable insights into its impact on firm performance, by exploring the mechanisms that lead to the demand for BMI [8]. In the healthcare context, innovative business models facilitate the adoption of new technologies and Resource Integration, thereby improving service delivery and patient outcomes [9].

Resources Integration (RI) is an important element in value creation that significantly influences Hospital Performance [10]. RI includes the effective use and combination of human, technological, and organizational resources to achieve optimal results [11]. Even though the potential benefits are large, the relationship between Resources Integration and Hospital Performance is complex and is often influenced by other variables such as Business Model Innovation [12]. To face this challenge, further in-depth research is needed on the interaction between Digital Transformation, Resources Integration, and Business Model Innovation in improving Hospital Performance [13].

According to Heij et al. [14] the innovation of a business model can be divided into two main categories, focusing either on replication, which is about enhancing an existing business model, or renewal, which introduces a new business model that is very different from the existing one. Therefore, this research focuses on the second category to justify its novelty in examining hospitals that are suspected of not implementing BMI because the main focus is usually on medical treatment. In addition, hospitals often carry out standard operating procedures without the support of digital technology. Existing criticism points to a lack of clear theoretical contributions and rigorous empirical research in the field of BMI in the health sector [15]. This study aims to fill this knowledge gap by investigating the impact of Digital Transformation and Resources Integration on Hospital Performance, with BMI as a mediating variable [16]. The focus on hospitals in Indonesia provides valuable insights into the dynamics of Digital Transformation and Resources Integration in a developing country context. It is hoped that the findings of this research will guide practitioners and policymakers in developing strategies and policies to improve Hospital Performance through BMI and digital technology integration [17], [18].

Aims of the Study

The aim of this study is to investigate the impact of Digital Transformation (DT) and Resources Integration (RI) on Hospital Performance (HP) with a particular focus on the mediating role of Business Model Innovation (BMI). This research seeks to fill the knowledge gap in understanding how DT and RI interact to influence HP, especially in the context of upper-middle-class hospitals in Indonesia. By examining these relationships, the study aims to provide valuable insights and practical strategies for hospital administrators and policymakers to enhance hospital performance through the integration of digital technologies and innovative business models. The findings are expected to guide the development of strategies and policies to improve healthcare delivery, operational efficiency, and patient outcomes in developing countries.

Theoretical Background

Theoretical Framework

Digital Transformation (DT) is increasingly recognized as a critical driver of organizational change and competitive advantage in various industries, including healthcare. It involves the integration of digital technology into all areas of a business, fundamentally changing how organizations operate and deliver value to customers. The Resource-Based View (RBV) theory [6], [19] provides a valuable lens through which to understand the impact of DT on hospital performance. According to RBV, organizations achieve sustained competitive advantage by utilizing valuable, rare, inimitable, and non-substitutable (VRIN) resources. In the context of hospitals, digital transformation can be considered a VRIN resource that enhances operational efficiencies, improves patient care, and fosters innovation. By leveraging advanced digital tools and technologies, upper-middle-class hospitals can optimize their processes, reduce costs, and deliver higher-quality healthcare services, ultimately enhancing their overall performance.

BMI [13] serves as a mediating factor in the relationship between DT and hospital performance [20]. The concept of BMI refers to the process of designing novel value propositions, value creation, and value capture mechanisms that differentiate an organization from its competitors. Dynamic Capabilities Theory posits that organizations must develop the ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments [21]. In the healthcare sector, this means that hospitals must continuously innovate their business models to adapt to evolving market demands, technological advancements, and regulatory changes.

Business Model Innovation

In the context of strategic management, in-depth analysis of BMI is becoming increasingly relevant [8]. When establishing a business company, either explicitly or implicitly, the company adopts a business model that encapsulates the design or architecture of the value, delivery, and utilization mechanisms it implements [13]. Revision and development of existing business models, as well as an emphasis on service model innovation, are key to facing pressures for sustainability [17]. While Business Model Innovation has been widely applied in developed countries, developing countries, including Indonesia, prioritize the creation and capture of value through cost efficiency [22], [23].

The essence of the business model concept is to describe how a company delivers value to customers, encourages customers to pay for that value, and converts those payments into profits [12]. This has become relevant in today's global context, where technology continues to develop rapidly and customer preferences change. In an era where rapid adaptation to market and technological changes is important, Business Model Innovation is the key to maintaining competitiveness and creating sustainable differentiation [12].

It has been acknowledged that BMI is crucial to SMEs' ability to remain competitive in a business environment that is changing quickly [24]. It should be highlighted, although, that there is a nonlinear link between BMI and performance, as contingency factors play a role. Therefore, to apply BMI, managers of SMEs must actively evaluate management techniques and build critical dynamic competencies inside the company. Gaining more insight into the wants and needs of customers is another factor that drives business model innovation [25]. The primary forces behind business model innovation are frequent shifts in the culture, behavior, and tastes of the consumer base. On the other hand, a business's success in business model innovation is typically measured by its capacity to provide clients with more relevant and

customized value, whether through goods, or services [26].

To succeed in Digital Transformation, leading companies focus on two complementary activities: reshaping the customer value proposition and transforming operations using digital technologies for greater customer interaction and collaboration [27]. In this context, the use of technology such as artificial intelligence (AI), Internet of Things (IoT), and blockchain is key in creating new added value.

However, one of the main challenges faced in Business Model Innovation is the change in organizational culture and processes required to support changes in business models [28]. Typically, this involves overcoming resistance to change within the organization and developing the ability to adapt quickly to market and technological changes.

Business Model Innovation is an important aspect of an organization's growth and differentiation strategy [13], [29]. By understanding changes in the business environment and customer needs, and by creatively leveraging new technologies, organizations can create business models that are more resilient and sustainable in the long term.

Digital Transformation and Business Model Innovation

In the digital era, business model innovation is essential to generate new value and adapt to changing market conditions [24]. Digitalization has facilitated the entry of new businesses into rapidly growing markets and driven innovation in products, applications, and services that are revolutionizing our way of life [9]. Business model innovation becomes important in this situation and offers a basic strategic framework [18] for companies to adapt to the rapidly evolving digital landscape while providing added value to various stakeholders, such as partners, suppliers, and customers.

Studies on the impact of digitalization on a company's Business Model Innovation highlight the importance of understanding the value proposition and position in the value network, which influences the available Business Model Innovation choices [15]. Although digitalization is considered important in general, the challenges faced in implementing Business Model Innovation in the context of Digital Transformation indicate the need for further development in the fields of strategic management, information systems, and organizational studies [30]. The research contribution [31] provides in-depth theoretical and managerial insights into Business Model Innovation driven by digital technology, while Digital Transformation opens up opportunities to create new business models in the ever-evolving digital market [27].

In addition to impacting the generation, delivery, and capture of value in nearly every industry, digital transformation is also fueling the emergence of new business models such as subscriptions, which are driven by social media and mobile devices and are changing the way customers make decisions about what to buy [32]. To meet the demands of the ever-evolving digital market, in this environment it is important to create new value determination techniques and increase the integration of technology and data [12]. Innovative business solutions to improve health system sustainability also rely heavily on digital transformation, which emphasizes the importance of implementing technology and business models that are able to adapt to changing market dynamics [33]. Based on this research, this study formulates the following hypothesis:

H1: Digital Transformation has a positive effect on Business Model Innovation.

Resources Integration and Business Model Innovation

Lean Startup Approaches have been proven to be an agile method in facilitating Business Model

Innovation in the context of digital entrepreneurship [34]. Through this approach, companies can test new ideas quickly, gauge market response [35], and adjust business models [36] according to the findings obtained from these experiments. A case study from Interface highlights that success in creating a sustainable business model depends on a company's ability to choose a path that suits its resources and capabilities, while overcoming operational obstacles that may arise [7].

The importance of developing superior strategies also emphasizes the need to consider the integration and organization of resources in various business models [29]. Effective integration of resources can create a solid foundation for a successful Business Model Innovation [37]. With appropriate control strategies in allocating and utilizing available resources, companies can identify new opportunities and face existing challenges more efficiently [38]. In this context, further research on integrated resource management strategies can provide valuable insights for companies in developing sustainable Business Model Innovation [18]. Based on this research, this study formulates the following hypothesis:

H2: Resource Integration has a positive effect on Business Model Innovation.

Digital Transformation and Hospital Performance

In the literature regarding Digital Transformation in the healthcare industry [39], there is evidence showing that digitalization has a positive impact on Hospital Performance or overall organizational performance [39], [40]. Several studies have highlighted how the implementation of information technology, data management systems, and digital platforms can improve operational efficiency, improve patient access to healthcare, and improve the overall patient experience [41]–[43]. Additionally, digitalization can also enable hospitals to optimize the use of resources, reduce administrative costs, and improve the quality of care, all of which contribute to the overall performance of the organization [39].

The importance of Digital Transformation in improving Hospital or organizational Performance is also reflected in the literature which highlights the adoption of new technology as a strategy to achieve organizational goals [44]. Research shows that investments in information technology infrastructure, implementation of advanced data management systems, and use of health applications can improve efficiency, accuracy, and patient safety [45]. In addition, Digital Transformation also allows hospitals to develop new business models that are more adaptive to environmental changes, expand the range of services, and increase collaboration between various departments and health service providers [46].

In the context of Digital Transformation, organizational performance is not only measured in terms of operational efficiency and service quality but also by its ability to adapt to change and generate long-term value for all stakeholders [35]. More recent research highlights the importance of holistic organizational performance measurement, which includes aspects such as innovation, social responsibility, and the ability to meet evolving market demands [47], [48]. In this view, Digital Transformation is considered one of the main catalysts in improving overall organizational performance, because it allows organizations to become more adaptive, responsive, and sustainable in a rapidly changing business environment [49], [50]. The research findings also demonstrate that exploratory and exploitative Digital Transformation has a favorable effect on business performance, based on a study of Chinese manufacturing organizations [43].

Based on this literature, this study formulates the following hypothesis:

H3: Digital Transformation has a positive effect on Hospital Performance.

Resources Integration and Hospital Performance

Resource integration has been identified as an important factor that contributes to Hospital Performance or overall organizational performance. The literature has highlighted that effective integration of various resources, including human resources, technology, facilities, and finance, can improve operational efficiency, improve service quality, and create added value [51], [52]. Studies also show that hospitals that successfully integrate resources tend to perform better in terms of patient care, cost management, and patient satisfaction [53]. This also explains that Hospital Performance is defined as the ability to efficiently manage information resources to achieve success effectively and obtain satisfaction with the results obtained [46], [54], [55].

As one of the resources in hospitals, the availability of beds can change the level of hospital resilience [55]. The availability of beds as an indicator of the fulfillment of health services in hospitals is measured by the Bed Occupancy Rate (BOR) [56]. The number of beds is a measure of determining hospital class in Indonesia [57], a minimum of 250 beds for class A general hospitals and a minimum of 100 beds for class A special hospitals. Meanwhile, class B general hospitals must meet a minimum of 200 beds. , and a minimum of 75 beds for class B specialty hospitals.

The important role of Resource Integration in improving Hospital Performance or healthcare organizations is also reflected in the literature which highlights the importance of cross-departmental collaboration and the involvement of all stakeholders [58]. Research has shown that when human, technological, and financial resources are interconnected and mutually supportive [59], [60], hospitals can achieve greater efficiency in the patient care process, reduce waiting times, and improve coordination between various service units [61], [62]. Thus, Resource Integration is not only about managing assets effectively but also about creating a collaborative and inclusive work culture across the organization [63].

In addition, the literature also highlights that Resource Integration has a positive impact on innovation and business model development in the healthcare context. By effectively integrating diverse resources, hospitals can increase their ability to adopt new technologies [54], develop innovative service programs, and adapt to changes in the external environment [64], [65]. In this case, Resource Integration is not just about improving operational performance, but also about creating a solid foundation for continuous innovation and competitive differentiation in an increasingly complex healthcare industry [66], [67].

By paying attention to these literature findings, we formulate the following hypothesis:

H4: Resources Integration has a positive effect on Hospital Performance.

Business Model Innovation and Hospital Performance

Business Model Innovation in the healthcare context is an important focus, especially in developing countries, where uncertainty and information asymmetry are often challenges in this industry [68]. The development of innovative business models not only leads to increased operational efficiency of hospitals and physician practices, but also strengthens the focus on high standards of care, clear separation between services, and a stronger orientation to patient needs [69]. Therefore, Business Model Innovation is considered an important step in ensuring the sustainability of the health system as a whole. IT companies in Pakistan also show that Business Model Innovation can increase competitive advantage and company performance by taking into account the factors of knowledge absorption capacity, organizational agility, and top management alertness [70].

The role of entrepreneurship has proven to be crucial in improving organizational performance through Business Model Innovation and strategic collaboration, especially in the context of the hospital industry in Indonesia [20]. When entrepreneurial aspects are implemented well, hospitals can be more responsive to changes in the environment and patient needs [26], which can ultimately improve the overall performance of the organization. Therefore, integrating entrepreneurial aspects in business model development is key to improving the quality of health services and Hospital Performance as a whole [20].

Not only applicable in the context of digital startups, but Business Model Innovation (BMI) has also been proven to contribute to sustainable performance in various industrial sectors, including retail, hospitality, and healthcare [11], [71]. Research has shown that BMI not only has a positive relationship with organizational performance but also plays an important role in maintaining a company's competitiveness in the face of continuously changing external environments. By understanding the importance of BMI, hospitals can develop more effective strategies for improving service quality and overall organizational performance [18], [72]. Based on this research, this study formulates the following hypothesis:

H5: Business Model Innovation has a positive effect on Hospital Performance.

Based on these hypotheses, we formed a research model as shown in Figure 1.

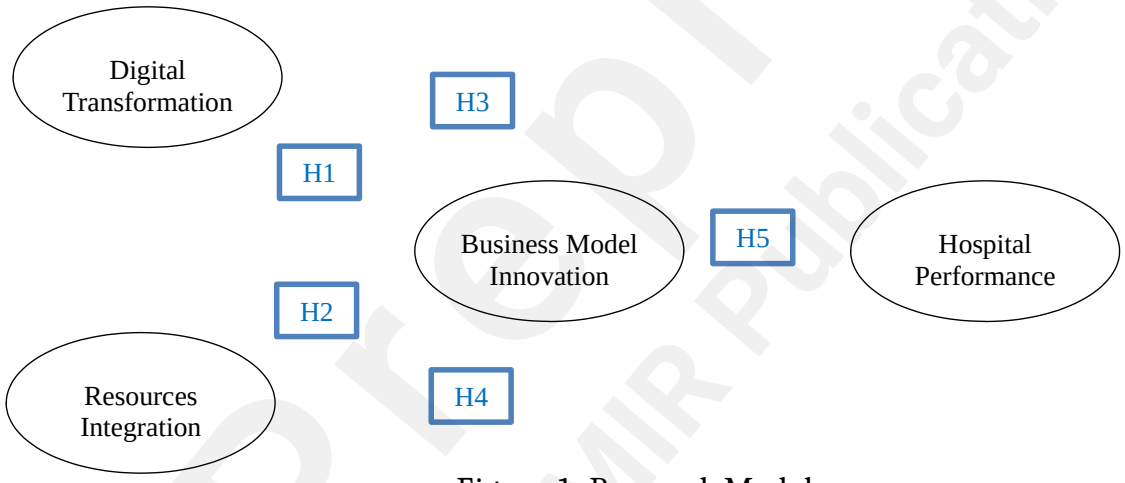

Figure 1: Research Model

Methods

Samples and Procedures

This study is a cross-sectional and non-experimental research, the instrument used is a closed questionnaire that includes items about informed consent, demographic data, hospital performance, digital transformation, resource integration, and business model innovation. The informed consent section contains information about the research and agreement to become a respondent. This questionnaire was designed using a 5-point Likert scale and sent via Google Form during July to September 2023 by inviting Directors of Class A and B Hospitals spread across large islands in Indonesia such as Java, Sumatra, Bali, Kalimantan, Papua, and Sulawesi via email and/or WhatsApp, as well as inviting via PERSI (Indonesian Hospital Association). Participants were selected using a simple random sampling method. Data were analyzed using structural equation modeling, which, according to Loehlin and Beaujean (2017), requires a minimum of 200 samples. This study covered a total of 241 class A and B hospitals.

Data Analysis

Measurement model analysis and structural model analysis were performed using Smart-PLS. To validate the measurement items and evaluate the dependability of the indicators, a measurement model analysis was carried out. Examining the convergent and discriminant validation helped evaluate the indicators' validation. Convergent validation, according to [73], was achieved with outer loading (>0.7) and AVE (>0.5). Heterotrait-Monotrait cross-loading was used to measure discriminant validity (HTMT). The cross-loading should demonstrate that the outer loading of the indicators on the associated construct is larger than any of its cross-loading. The mean of all correlations between indicators measuring various relative constructs in comparison to the mean of average correlations between indicators measuring the same construct is known as the HTMT criterion, where it can be considered to be acceptable if the values are around 0.885 and 0.9.

Coefficients of determination (R2 values), predictive relevance (Q2), and statistical significance of the structural path coefficients were used as evaluation metrics for the structural model. To assess collinearity, the VIF (<5) is used. The data are not assumed to be regularly distributed by PLS-SEM. Additionally, the SRMR value has been used for model fit analysis, with a value of less than 0.08 indicating the model's goodness of fit [74]. To determine the significance of coefficients, PLS-SEM uses a nonparametric bootstrap approach [73]. For this study, bootstrapping with 5,000 subsamples was selected to do path analysis [75].

Results

As a preliminary stage, the descriptive analysis was carried out to investigate the sample demographic profiles as indicated in Table 1. Additionally, the data were examined using the partial least squares structural equation model (PLS-SEM) with assistance from SmartPLS software version 4.0. Following the recommendations of [73]and [75], a two-step analysis approach was used. To ensure that all of the indicators or observed variables used were valid and reliable, the measurement model analysis first employed the Heterotrait-Monotrait Ratio of the correlations (HTMT), the average variance extracted (AVE), and Cronbach's alpha/composite reliability (CR) (especially in the reflective measurement model).

The structural model analysis, which included explanatory model analysis, measurement model analysis, and structural model analysis to determine the Variance Inflation Factor (VIF) used to assess collinearity, was the second phase in the two-step procedure.

Table 1: Demographic profiles of the samples (n = 241).

No	Demographic Profile	*n*	(%)
1.	Job Roles		
	President Director	208	86%
	Medical Services (Vice) Director	23	10%
	Medical Support (Vice) Director	10	4%
2.	Type of Hospital		
	Class A	12	12%
	Class B	213	88%
3.	Hospital's Years of Service		
	Less than 5 years	17	7%
	Between 5 to 10 years	35	15%

No	Demographic Profile	*n*	(%)
	More than 10 years	189	78%
4.	Ownership		
	Government	82	34%
	Non-Government	159	66%
5.	Hospital's Location		
	Greater Jakarta	106	44%
	Java (Outside Greater Jakarta)	68	28%
	Outside Java	67	28%

In Table 1 it can be seen that the majority of the respondents are President Directors (86%) followed by Medical Services Directors or Vice Directors (10%) and Medical Support Directors or Vice Directors (4%). The respondents lead mostly the class B hospitals (88%), while most of the hospitals have been operating for more than 10 years (78%). From the perspective of the ownership of the hospitals, the majority of respondents represent non-governmental hospitals, where most of the hospitals are located within greater Jakarta.

Measurement Model Assessment

Since all indicators had equal outer loadings on the construct and Cronbach's alpha was above the suggested cutoff value of 0.7 in Table 2, all indicators were deemed to be equally reliable. As per Hair & Sarstedt [76] and Hair et al. [77], the investigators excluded the components with loading values below 0.7. The composite reliability value of the model was more than 0.7, indicating a higher level of dependability [73]. The average variance that was obtained was used to assess the convergent validity of the model. Table 2 also shows that the AVE values exceed 0.50, meaning that the construct, on average, accounted for more than half of the variation in its indicators. Consequently, the model was judged to have a high degree of convergent validity.

Table 2: Measurement model analysis results.

Construct	Items	Cronbach's Alpha (0.6–0.9)	Composite Reliability (0.6–0.9)	Average Variance Extracted (>0.5)	Factor Loading (>0.7)	*t* -Value (>1.96)
Digital Transformation (DT)		0.888	0.896	0.643		
	T_1				0.807	31,336
	T_2				0.836	37,655
	T_3				0.800	32,940
	NT_1				0.799	29,330
	NT_2				0.711	18,345
	NT_3				0.851	45,375
Resources Integration (RI)		0.835	0.861	0.515		
	Itn1				0.784	25,488
	Itn2				0.779	31,470
	Itn3				0.798	28,863
	Itn4				0.798	30,683
	Mr_2				0.675	18,525
	Mr_3				0.701	19,111
Business Model		0.941	0.942	0.608		

Construct	Items	Cronbach's Alpha (0.6–0.9)	Composite Reliability (0.6–0.9)	Average Variance Extracted (>0.5)	Factor Loading (>0.7)	*t* -Value (>1.96)
Innovation (BMI)						
	BMI1				0.705	18,718
	BMI2				0.682	16,060
	BMI3				0.825	38,401
	BMI4				0.821	31,401
	BMI5				0.777	22,751
	BMI6				0.742	19,972
	BMI7				0.805	30,381
	BMI8				0.829	32,949
	BMI9				0.818	34,580
	BMI10				0.712	20,350
	BMI11				0.794	29,697
	BMI12				0.826	38,949
Hospital Performance (HP)		0.905	0.906	0.778		
	F_1				0.882	51,879
	F_2				0.885	52,464
	F_3				0.835	58,626
	Nf_1				0.827	37,747
	Nf_6				0.826	43,724

Table 3 shows that in all constructs, the HTMT ratios were less than 0.9. This indicates that the majority of the region's (conservatively) conceptually related notions [78]were included in the trajectory model. After that, the model fit analysis was carried out using the PLS technique, and the results showed that the standardized root mean square residual (SRMR) was 0.07, which remained inside the model fit criterion [74].

Table 3: Correlation matrix (HTMT ratio).

Constructs	BMI	DT	HP	RI
Business Model Innovation (BMI)				
Digital Transformation (DT)	0.669			
Hospital Performance (HP)	0.798	0.620		
Resources Integration (RI)	0.737	0.761	0.791	

The coefficient of determination of the analysis's conclusions was calculated using the PLS approach. Table 4 shows that the R^2 values for the Business Model Innovation (BMI) and Hospital Performance were 0.495 and 0.607. This indicates that the BMI construct is expected to be 49.5% by DT and RI, while the other constructs anticipate it to be 51.5%. As its value is 0.495, it can be considered moderate.

Table 4: Coefficient of determination and predictive relevance

Construct	R^2	Q^2
Business Model Innovation (BMI)	0.495	0.477
Hospital Performance (HP)	0.607	0.478

Besides, HP's Coefficient of Determinants (R2) was 0.607, indicating that HP predicted 60.7% of the construct, with the remaining 39.3% coming from other constructs. Additionally, the blindfolding-based, cross-validated redundancy metric Q2 was computed using SmartPLS's

PLSPredict Function. The result showed Q2 values slightly less than 0.50, indicating the relatively medium prediction accuracy of the PLS path model.

Table 5: PLSpredict results.

Items	*RMSE PLS*	*RMSE LM*	*Comparison Results*
BMI_1	0.560	0.587	Smaller
BMI_10	0.718	0.746	Smaller
BMI_11	0.648	0.665	Smaller
BMI_12	0.602	0.626	Smaller
BMI_2	0.576	0.592	Smaller
BMI_3	0.569	0.581	Smaller
BMI_4	0.594	0.623	Smaller
BMI_5	0.617	0.641	Smaller
BMI_6	0.614	0.643	Smaller
BMI_7	0.584	0.605	Smaller
BMI_8	0.615	0.637	Smaller
BMI_9	0.606	0.623	Smaller
F_1	0.774	0.763	Smaller
F_2	0.785	0.795	Smaller
F_3	0.653	0.662	Smaller
Nf_1	0.555	0.563	Smaller
Nf_6	0.643	0.645	Smaller

Table 5 presents a comparison of the RMSE of PLS and RMSE LM and the values of RMSE PLS are smaller than RMSE LM. It indicates that the model has large predictive potential given that all of the RMSE PLS values were lower than RMSE LM. The assessment of the measurement model suggests that it provided a high degree of prediction accuracy.

Measurement Model Assessment

The first analysis was carried out to ascertain whether there was any collinearity among the predictor constructs to verify that collinearity did not result in biased regression results. As a result, the variance inflation factor (VIF) values were used to evaluate it. The collinearity could be found, if the constructs have values between 3 and 5 [73]. Since Table 6 shows that the VIF values of the inner model are less than 3, then it can be said that they lack collinearity.

Table 6: Variance inflation factor (VIF) result of Inner Model.

Constructs	BMI	DT	HP	RI
Business Model Innovation (BMI)			1,979	
Digital Transformation (DT)	1,800		1,995	
Hospital Performance (HP)				
Resources Integration (RI)	1,800		2,209	

The significance and applicability of the path coefficients in the model were determined by the following analysis. The findings of a bootstrapping study that was carried out to measure it are shown in Figure 2.

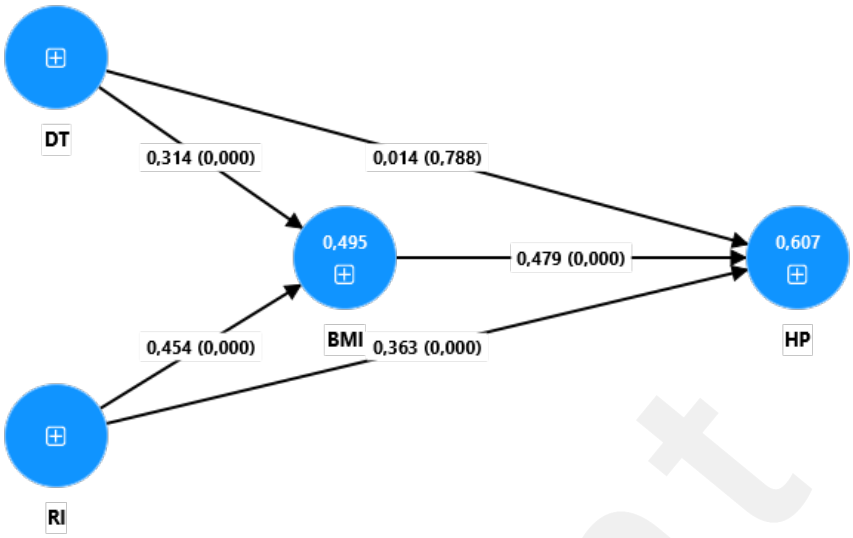

Figure 2: Structural Model Analysis using Bootstrap with subsamples = 5,000.

This methodology was also used to test the hypothesis, as Table 7 shows. The result (t-value of less than 1.96) shows that the path between Digital Transformation (DT) and Hospital Performance (HP) was the only one among the constructs to have an insignificant effect, while the remaining hypotheses are supported (with alpha error less than 0.05). It implies that the Digital Transformation statistically had little effect on Hospital Performance (HP).

Table 7: Hypothesis test results.

Hypothesis	Structural Paths	Standardized Coefficient (β)	p -Values	Hypothesis Test Results
H1	Digital Transformation – Business Model Innovation	0.314	0,000	Supported
H2	Resources Integration – Business Model Innovation	0.454	0,000	Supported
H3	Digital Transformation – Hospital Performance	0.014	0.788	Not supported
H4	Resources Integration – Business Model Innovation	0.363	0,000	Supported
H5	Business Model Innovation – Hospital Performance	0.479	0,000	Supported

Discussion

Digital Transformation and Hospital Performance

Digital Transformation has very little direct influence on Hospital Performance. So with a coefficient of 0.014 and a p-value of 0.788, it shows that this effect is not significant. This means that just by adopting digital technology, hospitals will not automatically experience improved performance. These findings support the view that digital technology must be well integrated into hospital operations and strategy to have a significant impact.

The adoption of digital technologies must be accompanied by significant changes in business processes and organizational culture [79] to achieve the desired results [48]. Digital technologies can offer more efficient tools and platforms for information management, communication, and coordination, but without fundamental changes in the way organizations work and structure, the full benefits of these technologies will not be achieved. For example, a study by Westerman et al. [80] emphasized that the success of Digital Transformation depends

on an organization's ability to change its operating model as a whole.

Digital Transformation enables hospitals to automate administrative and clinical processes, such as patient registration, medical record management, and appointment scheduling, which in turn reduces manual workload, increases operational efficiency, and reduces human errors [81]. Additionally, implementing data analytics allows hospitals to analyze patient health data more effectively, providing insights that can be used to make better, faster decisions. Telemedicine, as one concrete example of Digital Transformation in BMI, allows hospitals to offer health services remotely, increasing accessibility, and providing convenience for patients who are clients of B2B companies such as insurance companies or other health service providers [82]. The use of integrated health information systems also facilitates the exchange of information between hospitals and B2B partners, improving care coordination and the quality of services provided.

Resource Integration and Hospital Performance

Resource Integration has a more significant influence on Hospital Performance. This shows that a hospital's ability to integrate various resources is very important in improving its performance. Resource Integration includes efficient management of human, technological, information, and financial resources so that hospitals can operate more smoothly and be responsive to patient needs.

Organizations that can manage and integrate resources effectively tend to perform better. Barney [6]emphasizes the importance of an organization's ability to develop and combine unique and valuable resources as a source of competitive advantage. In a hospital context, this could mean integrating information technology systems with clinical workflows to improve operational efficiency and quality of patient care.

Resource Integration also includes a hospital's ability to collaborate with various stakeholders, including suppliers, technology partners, and other healthcare communities [4]. Partnerships with technology companies can result in innovative solutions such as connected medical devices or digital health applications that improve the quality of healthcare services and hospital operations. Integration with other service providers such as laboratories and pharmacies enable the provision of more comprehensive and coordinated services. Digital supply chain management enables hospitals to optimize inventory and ensure timely availability of medical equipment and medicines, reducing operational costs and increasing efficiency. Collaboration platforms enable hospitals and other units to share information in real-time [46], improving response to sudden requests and reducing lead times.

Human resource development through e-learning platforms and digital-based training programs is also important in the digital era where technology continues to develop. The use of artificial intelligence (AI) and data science in hospital operations enables better data analysis and smarter decision-making, which in turn improves the overall performance of hospitals [83].

The Mediating Role of Business Model Innovation

Business Model Innovation plays an important mediating role between the two antecedent variables and Hospital Performance. Where Resources Integration also has a significant influence on Business Model Innovation, and Business Model Innovation shows a significant influence on Hospital Performance.

These findings indicate that innovation in business models is the key to linking Digital Transformation and Resources Integration with improving Hospital Performance. Innovative

business models can enable hospitals to utilize digital technology and available resources more effectively and efficiently. For example, innovations in business models may include the development of telemedicine services, which enable hospitals to reach patients in remote areas and provide more accessible care [84].

Previous studies also emphasize the importance of Business Model Innovation in utilizing digital technology and existing resources to achieve competitive advantage and improve organizational performance. For example, research by Chesbrough [10] shows that Business Model Innovation can be a key factor in the adoption of new technologies, as it allows organizations to create new value for customers and other stakeholders. In the hospital context, this could mean the development of more integrated and patient-centered care models, supported by digital technologies to improve the quality and efficiency of care [85].

Conclusion

The results of this research highlight that although Digital Transformation and Resource Integration are important, these two variables do not influence home performance directly, but are mediated by Business Model Innovation. To improve Hospital Performance, management needs to focus not only on digital technology and Resource Integration but also on good Business Model Innovation. In this way, hospitals can maximize the benefits of digital technology and available resources to improve the efficiency and quality of their services.

Overall, the results of this research highlight that Business Model Innovation acts as an important bridge connecting Digital Transformation and Resource Integration with improving Hospital Performance [68]. Therefore, hospital management needs to focus on developing and implementing innovative business models to maximize the benefits of digital technology and existing resources.

BMI in a B2B context, supported by Digital Transformation and Resource Integration, can bring significant improvements in Hospital Performance. Good performance provides comfort for patients who are clients of B2B companies such as insurance companies or other health service providers. Digital Transformation improves operational efficiency and service quality, while Resource Integration and human resource development enable hospitals to remain competitive and innovative. Thus, effective implementation of BMI will prepare hospitals to face future challenges in the healthcare industry, ensuring sustainability and improving overall performance.

Implications

The theoretical contributions of this research are twofold. First, it examines the relationship between DT effort and RI to BMI. Therefore, enriching the research on the antecedents of BMI. Second, this study reveals the inside-out value developing mechanism of BMI effort on firm performance. In most previous studies, both DT effort and RI have been positioned as direct predictors or moderators of firm performance and other outcomes.

RI plays an important role in improving hospital performance. Hospital management must focus on optimizing resource integration, including workforce, equipment, and technology. By maximizing the use of existing resources and integrating them well, hospitals can improve operational efficiency and service quality. Apart from that, DT also shows a significant influence on BMI, which in turn improves HP. This indicates that hospitals need to adopt digital technology strategically to encourage innovation in business models, such as through the implementation of integrated hospital management systems, AI, or the use of telemedicine

technology.

This research emphasizes the importance of BMI as a mediator in the relationship between DT and RI and HP. Hospital management must understand that innovation in business models is the key to linking digital technology adoption and resource integration with improved hospital performance. Therefore, hospitals need to develop adaptive and innovative business models, which can respond to changes in the external environment and patient needs. This could include the development of new patient-focused services, outcomes-based payment models, or collaboration with other healthcare providers [82]. In this way, hospitals can not only improve performance but also ensure long-term sustainability in facing the challenges and opportunities offered by the digital era.

Limitations and further research

This research is limited to class A and B hospitals in Indonesia as a developing country, so the results may not be generalizable to the context of hospitals in general including lower classes and clinics. Additionally, the quantitative methods used in this research, although providing a clear picture of the relationships between variables, are unable to capture the deeper nuances and dynamics that might be revealed through a qualitative approach.

For further research, it is recommended to add other variables such as business ecosystem, government policy, and external environmental factors as moderating variables, as well as expanding the geographic scope of the research to include hospitals in various countries, thereby allowing comparisons across cultures and health systems. Further research could also adopt mixed methods that combine quantitative and qualitative approaches to gain a more comprehensive understanding of how Digital Transformation and Resources Integration influence Hospital Performance through Business Model Innovation. Additionally, in-depth research into the specific factors that support or inhibit business model innovation in hospitals could provide additional insights useful for hospital administrators and policymakers.

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Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix 1. Research Instruments

Construct		Items	Adapted from
Hospital Performance			
Financial	F_1	Increase in hospital income	Behrouzi & Ma'aram [86], Alolayyan et al. [54], Pishnamazzadeh [55], Yang & Yao [52], Hsiao [51], Binsar et al. [53],
	F_2	Increased net profit/residual operating results Hospital	
	F_3	Hospital shows management improvement	
Non-Financial	NF_1	Increased patient satisfaction rate	
	NF_2	Decreased medical procedure error rate	
	NF_3	Hospital reputation nationally	
	NF_4	The regional reputation of Hospitals	
	NF_5	Increased medical tourism patient visits	
	NF_6	Hospital growth	
Business Model Innovation			
Value Capturing	BM1	Fulfillment of patients' needs	Wirtz, B., & Daiser [87], Latifi et al. [88], Chin et al. [25], Yopan et al. [26], Stefano Fanfarillo et al. [12] Montasser et al. [23], Yadav et al. [22], Tenggono et al. [28]
	BM2	Patient problem solving	
	BM3	Introduced new values to patients	
	BM4	Introduced new values to partners	
	BM5	Significantly changed the core set of main activities	
Value Delivery	BM6	Establishing new collaborations with third parties to improve value propositions	
	BM7	Patients, suppliers, distributors, and agents innovatively integrated into healthcare delivery	
	BM8	Reconfigured the value chains to make them more efficient	
Value Creation	BM9	Introduced a new way to reduce costs	
	BM10	Implemented a new pricing mechanism	
	BM11	Introduced a new way to make a profit	
	BM12	Created new revenue sources	
Resource Integration			
Intangibles	ITN_1	In the view of patients, the hospital's reputation is excellent	Vélez-González et al. [60], Williams et al. [59], Grant [89], Yang & Yao [52], Hsiao [51]
	ITN_2	Medical personnel who are skilled in their specialty are available	
	ITN_3	Availability of employees with good communication skills	
	ITN_4	The ability of the hospital to integrate resources to improve performance	
Tangibles	TN_2	Design building of hospitals	
	TN_3	Medical devices and new technologies	
Digital Transformation			
Technology	T_1	Complete adoption of digital technology	Verina & Titko [90], Hilali & Manouar [91], Bumann & Peter [92],
	T_2	Use of digital technology to improve service activities	

	T_3	Digital technology updates by the latest developments in the health sector	
Non-Technology	NT_1	Staff support for changes according to digital transformation needs	
	NT_2	Patient involvement in service processes that use digital technology	Gulati et al. [93], Cetindamar et al. [94], Agostino et al. [95], Binsar et al. [45],
	NT_3	Adjustment of business processes to the development of digital technology	