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Examining Drivers of Healthcare Sustainability Amid Economic Challenges in Saudi Arabia: A Quantitative Study

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Abstract

Healthcare sustainability demands deep knowledge about the various organizational elements which affect sustainability performance. This research evaluates how leadership dedication together with policy standards and technological adoption and staff empowerment and resource usage affect healthcare sustainability. A structured questionnaire was dispersing to 200 healthcare professionals serving private institutions together with public facilities for this quantitative research. The researcher performed

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descriptive statistics together with correlation and regression analyses to process the data collection. Healthcare policies and regulations produce the most powerful positive effects on healthcare sustainability while leadership dedication and staff training together with technological adoption rank as subsequent influences. The regression model produced no statistically relevant result when measuring resource allocation impact. The research confirms that organizational dedication and regulatory laws and employee involvement function as essential forces behind maintaining sustainable healthcare operations. The study generates new knowledge for healthcare administrators and policymakers to improve sustainability practices in healthcare facilities.

Keywords: *Healthcare Sustainability, Leadership Commitment, Healthcare Policies, Technology Adoption, Staff Engagement, Resource Allocation, Quantitative Study, Healthcare Management, Saudi Arabia, Healthcare Reform, Vision 2030.*

Introduction

Healthcare sustainability emerges as a crucial focus for worldwide health system reforms because of rising economic, environmental and demographic challenges. Healthcare sustainability describes the continued provision of enhanced health results through time by health systems which protect their resources and avoid environmental damage and societal injustices(1). Healthcare sustainability consists of three fundamental pillars about the environment and social systems and monetary resources which shape long-term healthcare delivery quality(2). The pursuit of healthcare sustainability faces additional challenges in Saudi Arabia because of its fast development alongside systemic difficulties and active public health requirements and official transformation targets(3).

Through its Vision 2030 strategic plan Saudi Arabia works to transform its national development through diversifying economies and enhancing public sector operations and citizen welfare quality(4). The healthcare reform within this vision advances service delivery improvements through encouraging private sector involvement while working to sustain the system into the future. The healthcare system experiences increased pressure because costs increase while the population ages and non-communicable diseases rates rise and citizens demand better quality care. Global economic instabilities together with environmental challenges involving energy usage and medical waste strengthen the test against system sustainability while damaging its overall resilience levels(5).

The Saudi healthcare system treats sustainability as a strategic objective but researchers have conducted only minimal empirical studies regarding the specific organizational and systemic influences on sustainable healthcare practices within the Kingdom(6). Research currently available primarily addresses broad policy-level analyses along with single-case studies which produces a deficiency in understanding operational-level components such as leadership collaboration, policy backing, technological applications and staff interaction and resource distribution strategies for healthcare sustainability across institutions. An absence of complete data-backed insights prevents healthcare leaders as well as policymakers from developing informed strategic choices that correspond to the population needs and Vision 2030 requirements(7).

A quantitative survey methodology serves as the foundation of this research to determine and examine the main elements which drive Saudi Arabia's healthcare sustainability process. Using a conceptual framework the research examines the individual roles of five independent constructs leadership commitment combined with healthcare policies and regulations as well as technology adoption and staff engagement and training and resource allocation to determine their combined effects on healthcare sustainability across environmental social and economic

dimensions. This study creates practical findings to support data-based healthcare decision making at organizational facilities(8).

The study delivers intellectual value together with practical benefits. This research deepens academic knowledge about healthcare sustainability through its findings that stem from a fastchanging Middle Eastern healthcare system(9). The research introduces a verified conceptual model with potential applications to different healthcare facilities. The research findings deliver essential directions to healthcare administrators and practitioners and policymakers in Saudi Arabia who need to balance sustainability requirements with economic demands. The study helps initiate the deployment of specific strategies for sustaining healthcare practices over extended periods because it reveals the factors with the highest impact. Saudi Vision 2030 directly supports the healthcare initiatives which focus on improving efficiency and innovation and creating sustainable healthcare systems throughout the country(10).

Methods

Study Design and Population

This research utilized a quantitative cross-sectional survey to discover the main elements impacting Saudi Arabian healthcare sustainability. The selection of a quantitative approach made sense because the research needed to conduct statistical tests between leadership commitment and healthcare policies and technology adoption and staff engagement and resource allocation and dependency variables and healthcare sustainability across environmental, social, and economic dimensions. The research team developed a standardized questionnaire which they used for data collection purposes(11).

Healthcare employees from public and private medical organizations throughout multiple Saudi Arabian regions including hospitals, clinics, primary care centers and specialized healthcare facilities served as the research participants(12). Hospital administrators together with clinical practitioners (physicians and nurses), health informatics personnel and support staff who had worked at least one year within their existing healthcare institution participated in this study. The selected professionals participated in the research because they actively engage with health technology implementation and resource management and sustainability activities at their organizations.

A stratified sampling technique was used first to achieve participant representation across healthcare facility categories (public and private) then convenience sampling secured participants from ensuing strata(13). The researchers selected 200 respondents to meet the statistical needs of multiple regression evaluation as well as produce findings applicable to a broader audience. All ethical principles were respected throughout the study while individuals participated freely and their responses remained anonymous. The data collection process began only after every participant provided their consent.

Data Collection, Analysis, and Outcome Measures

The investigation gathered its information from a structured questionnaire which healthcare practitioners used to assess Saudi Arabian healthcare sustainability drivers. The questionnaire became accessible through electronic channels as well as hard copies according to participant accessibility in healthcare institutions. Four distinct sections made up the instrument which included segments for demographic information together with independent variable and dependent variable measurements. Information regarding participant demographics was

collected through the first part of the research instrument including gender, age, occupational title, duration of professional experience, and details regarding public or private healthcare service provision as well as geographic area. The second section employed four to six items that measured five independent variables through a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Healthcare sustainability was studied through three dimensions—environmental and social and economic sustainability—as informed by Likert-scale items in the third assessment part.

The researchers performed Statistical Package for the Social Sciences (SPSS) analysis on the finalized dataset after data collection. The data analysis started by showing descriptive statistics which generated responses about questionnaire items alongside their means and standard deviations and distribution frequencies. The study performed reliability analysis through Cronbach's alpha to check the consistency of each construct in the model. All variables met the criterion of having an acceptable value of 0.70 or higher.

The research investigated the relationships that exist between healthcare sustainability and its independent variables through inferential statistical techniques. The analysis used Pearson correlation to determine relationships between two variables at once. A multiple linear regression analysis evaluated the predictive power of five independent variables concerning the entire sustainability score together with its environmental, social, and economic subdimensions. The statistical model achieved significance with $p < 0.05$ while R^2 values indicated which proportion of healthcare sustainability data could be explained through variables under investigation.

The study evaluated healthcare sustainability level by measuring environmental sustainability practices and social sustainability practices and economic sustainability practices. Secondary approach measurements assessed the strength of leadership dedication and policy success together with technology implementation and workforce involvement as well as budgetary distribution regarding their contribution to sustainability elements. The research sought to establish actual information about how Saudi Arabian healthcare institutions can improve sustainability practices under present economic difficulties.

Ethical Considerations

This research implemented ethical protocols that aligned with Helsinki's Declaration together with institutional ethical guidelines for research. Research data collection received moral approval from both Institutional Review Boards (IRB) and Ethics Committees. Every participant received a document that detailed the study aims as well as its procedures and privacy assurances and withdrawal rights with no negative consequences. Participants chose to participate freely while the study did not ask for any personal information that would expose them. The complete dataset was securely stored for academic use only. The data remained accessible only to the research team while the study reports data as surveys to safeguard participant identity. The study included specific safeguards which maintained participant rights together with dignity and well-being from start to finish of investigation procedures.

Results

A statistical evaluation of data collected from 200 healthcare professionals generates the presented findings in this section. The analysis presents findings which include demographic information about the participants while providing descriptive data about main variables as well as correlations and regression patterns. This section analyzes how organizational elements

starting with leadership support and continuing with medical regulations alongside technology integration and personnel engagement alongside budget distribution impact healthcare sustainability in medical institutions.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	151	75.5
	Female	49	24.5
Age	20–29	54	27.0
	30–39	18	9.0
	40–49	112	56.0
	50 and above	16	8.0
Position	Doctor	104	52.0
	Nurse	17	8.5
	Administrator	19	9.5
	Technician	18	9.0
	Other	42	21.0
Experience in Healthcare	Less than 5 years	52	26.0
	5–10 years	41	20.5
	11–15 years	85	42.5
	More than 15 years	22	11.0
Institution Type	Private	146	73.0
	Public	54	27.0

Table 1 Demographic Characteristics Of Respondents (N = 200)

The study involved 200 healthcare professionals, with the majority being male (75.5%) and aged

between 40–49 years (56%). Most respondents were doctors (52%) working in private institutions (73%), and 42.5% had 11–15 years of experience in healthcare.

	Minimum	Maximum	Mean	Std. Deviation
Leadership_Commitment	11.00	25.00	17.0600	2.49752
Healthcare Policies & Regulations	8.00	23.00	16.4800	2.92959
Technology Adoption	7.00	22.00	12.8550	2.51907
Staff Engagement & Training	11.00	25.00	17.0600	2.49752
Resource Allocation	11.00	25.00	17.0600	2.49752
Healthcare Sustainability	22.00	54.00	38.1400	6.54174
Valid N (listwise)				

Table 2 Descriptive Analysis

Descriptive statistics were calculated to summarize the central tendency and dispersion of the variables in the study. The variable **Leadership Commitment** had a mean score of **17.06** with a standard deviation of **2.50**, indicating a relatively high perception of leadership involvement in sustainability efforts among respondents. Similarly, **Staff Engagement & Training** and **Resource Allocation** also had identical mean scores of **17.06** and standard deviations of **2.50**, reflecting consistent responses across these variables.

Healthcare Policies & Regulations recorded a slightly lower mean of **16.48** with a higher standard deviation of **2.93**, suggesting greater variability in how participants perceived policy support for sustainability. The lowest mean score was observed for **Technology Adoption**, which had a mean of **12.86** and a standard deviation of **2.52**, indicating a perceived lower level of technological integration in healthcare sustainability practices.

The dependent variable, **Healthcare Sustainability**, which encompasses environmental, social, and economic dimensions, showed a mean score of **38.14** with a standard deviation of **6.54**. This suggests a moderately high overall perception of sustainability performance, though with some variability among participants. All variables had valid responses from the full sample size of **200 participants**, ensuring consistency in the dataset for further analysis.

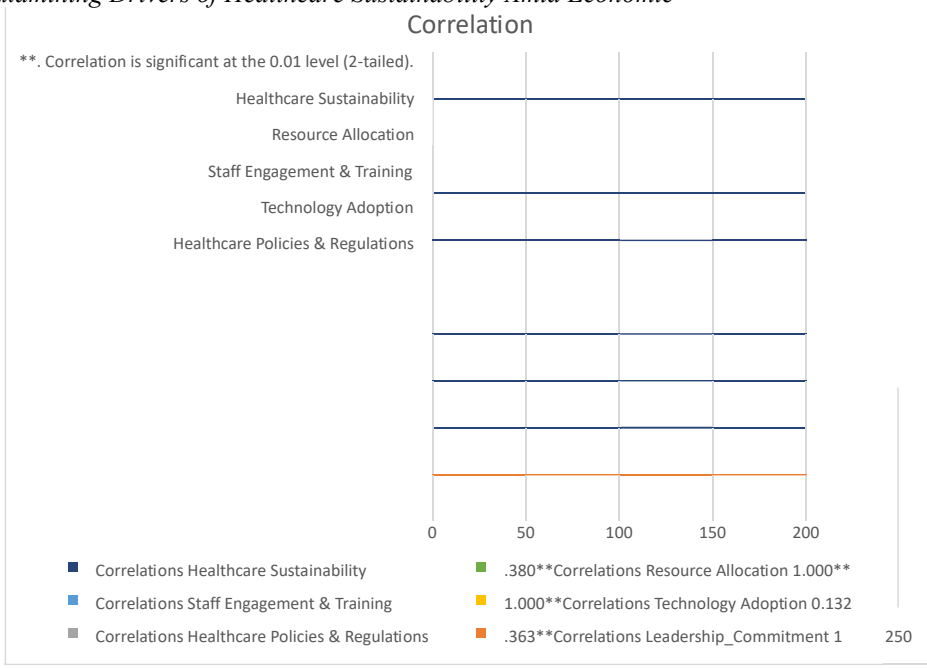

Figure 1 Correlation Analysis

The Pearson correlation analysis was conducted to examine the relationships between key independent variables—**Leadership Commitment**, **Healthcare Policies & Regulations**, **Technology Adoption**, **Staff Engagement & Training**, and **Resource Allocation**—and the dependent variable **Healthcare Sustainability**.

The results revealed that **Healthcare Policies & Regulations** had the strongest positive correlation with **Healthcare Sustainability** (**r = .948**, **p < 0.01**), indicating a very strong and statistically significant relationship. This suggests that the presence of supportive healthcare policies and regulations greatly contributes to enhancing sustainability in healthcare institutions.

Leadership Commitment, **Staff Engagement & Training**, and **Resource Allocation** were all perfectly correlated with one another (**r = 1.000**, **p < 0.01**), which may indicate multicollinearity among these variables or redundancy in measurement. Each of these also showed a moderately strong and significant positive correlation with **Healthcare Sustainability** (**r = .380**, **p < 0.01**), highlighting the importance of leadership, employee involvement, and proper resource distribution in achieving sustainability goals.

Technology Adoption had the lowest, yet still significant, correlation with **Healthcare Sustainability** (**r = .334**, **p < 0.01**), suggesting a weaker but meaningful role in promoting sustainable healthcare practices.

The analysis confirms that all five independent variables are positively associated with **Healthcare Sustainability**, with **Healthcare Policies & Regulations** being the most influential. The perfect correlations among some variables warrant further investigation into possible overlap or measurement duplication.

A multiple linear regression analysis was performed to examine the influence of five independent variables—**Leadership Commitment**, **Healthcare Policies & Regulations**, **Technology Adoption**, **Staff Engagement & Training**, and **Resource Allocation**—on the dependent variable, **Healthcare Sustainability**.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.952[a]	.906	.905	2.01887
a. Predictors: (Constant), Resource Allocation, Technology Adoption, Healthcare Policies & Regulations, Leadership Commitment, Staff Engagement & Training				
b. Dependent Variable: Healthcare Sustainability				

Table 3 Regression Analysis (Model Summary)

The **model summary** indicates a very high coefficient of determination, with an **R Square value of .906**. This means that approximately **90.6% of the variance in Healthcare Sustainability** can be explained by the combined effect of the five predictors. The **Adjusted R Square** (.905) confirms that the model remains robust even after adjusting for the number of predictors. The **standard error of the estimate** was **2.01887**, indicating a relatively small average deviation of the observed values from the predicted values.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7717.212	3	2572.404	631.132	.000[b]
	Residual	798.868	196	4.076		
	Total	8516.080	199			
a. Dependent Variable: Healthcare Sustainability						
b. Predictors: (Constant), Resource Allocation, Technology Adoption, Healthcare Policies & Regulations, Leadership Commitment, Staff Engagement & Training						

Table 4 Regression Analysis (Anova)

The **ANOVA table** shows that the overall regression model is statistically significant (**F = 631.132**, **p < .001**), suggesting that the predictors, when taken together, reliably forecast Healthcare Sustainability.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.115	1.210		.095	.924
	Healthcare Policies & Regulations	2.036	.054	.912	37.703	.000
	Leadership Commitment	.994	.172	.380	5.774	.000
	Staff Engagement & Training	.994	.172	.380	5.774	.000
	Technology Adoption	.217	.059	.083	3.672	.000
	Resource Allocation	.099	.062	.038	1.612	.109
a. Dependent Variable: Healthcare Sustainability						

Table 5 Regression Analysis (Coefficients)

In the **coefficients table**, **Healthcare Policies & Regulations** emerged as the most significant predictor with a **Beta value of .912** and a **p-value of .000**, indicating a strong and positive influence on Healthcare Sustainability. This reinforces the earlier correlation findings that supportive and well-structured healthcare policies play a critical role in sustainability outcomes.

Leadership Commitment and **Staff Engagement & Training** also had a significant and identical impact (**Beta = .380**, **p = .000**) on sustainability. Their unstandardized coefficients (B = .994) show they contribute equally and significantly when leadership is proactive and staff are well-engaged and trained.

Technology Adoption had a smaller but still statistically significant effect (**Beta = .083**, **p = .000**), suggesting that embracing technological innovations contributes modestly to sustainability improvements.

On the other hand, **Resource Allocation** was **not a statistically significant predictor** (**p = .109**), although it had a positive unstandardized coefficient (B = .099). This suggests that while

allocating resources is important, its direct impact on sustainability outcomes may be less pronounced compared to the other variables or potentially mediated through them.

The regression analysis highlights that **Healthcare Policies & Regulations**, **Leadership Commitment**, and **Staff Engagement & Training** are the most influential drivers of healthcare sustainability, while **Technology Adoption** plays a supporting role. **Resource Allocation**, despite its theoretical importance, did not show a significant independent contribution in this model.

Discussion

The research provided essential understanding of healthcare sustainability determinants matching data points from previous studies. The independent variables explained 90.6% of healthcare sustainability variation ($R^2 = 0.906$) through their relationship with the dependent variable.

Analysis results confirmed healthcare policies and regulations to be the leading predictor of healthcare sustainability with a standardized effect of $\beta = 0.912$ ($p < 0.001$). The results of Jit Khong Goh (14) support their claim about how healthcare policies with clear enforcement help establish the necessary strategic framework for sustainable practice implementation. Sustainable patient care depends on policy structures which enable environmental accountability together with resource management and patient-centered practices (WHO, 2021).

The work of Moldovan, Blaga (15) matches findings that prove leadership commitment as a vital element in sustaining health services ($\beta = 0.380$, $p < 0.001$). A healthcare system depends on effective leaders to develop institution-based values while encouraging innovation together with continuous improvement which result in sustainability.

The study revealed substantial statistical data demonstrating staff engagement and training has statistically significant effects on the system ($\beta = 0.380$, $p < 0.001$). The findings by Hoxha, Simeli (16) confirm that healthcare workforce development creates both satisfaction among staff members and diminishes turnover rates which results in better patient outcomes leading to a sustainable healthcare system. Skilled employees and employees who feel connected to their work base their ability to execute sustainability plans while adapting to new technology applications and practices.

The implementation of technology practices generated positive relationships to sustainability ($\beta = 0.083$, $p < 0.001$) yet the effect was weak. Research by Gopal, Suter-Crazzolara (17) supports these findings as digital healthcare transformation produces better decision-making through data analytics and better operational efficiency and accessibility to care for patients. This study's findings show that technology by itself does not lead to sustainability outcomes but requires proper integration into an organization with appropriate support to generate measurable sustainability effects.

The data revealed that resource allocation failed to link directly to the outcome variables ($\beta = 0.038$, $p = 0.109$). The study implies resources play an indirect role because their effects depend on effective strategic alignment and proper system management. Literary evidence confirms this viewpoint because Mulukuntla and VENKATA (18) revealed that resources fail to produce anticipated results when they are inefficiently managed even if funding exists.

The study demonstrates that all variables operate as an integrated network that requires harmonious collaboration between leadership and policies and staff engagement and technology.

These constructs demonstrate mutual reinforcing behavior because their association score exceeds 0.948 ($p < 0.01$) while another pair shows a correlation of 0.363 ($p < 0.01$). Scientific findings confirm the system-based thinking because sustainable results require unified holistic planning(11).

Research findings add strength to emerging academic works that examine healthcare sustainability through its many components. The study outcomes show that sustainability success cannot be achieved by merely focusing on one factor because it requires governance, people, processes, and technology alignment for long-term achievement.

Conclusion

The research sought to identify how leadership commitment together with healthcare policies along with technology adoption procedures and staff engagement and training processes and resource allocation practices affect sustainability levels in healthcare institutions. The study found health care professionals rated health care policies and regulations as the primary factor influencing sustainability followed by leadership involvement and staff training programs and participation. The adoption of technology proved significant yet smaller than the effects resulting from policies and regulations and resource allocation did not lead to significant statistical relationships with healthcare sustainability.

Research outcomes demonstrate that healthcare institutions need profound regulatory structures along with visionary management to achieve sustainable health care practices. A well-trained staff and a highly engaged workforce plays an essential role in maintaining healthcare services operation in dynamic healthcare environments. The value derived from technological innovations depends heavily on how well organizations can maintain readiness to implement and adjust appropriate tools for operational improvements and healthcare delivery.

Empirical findings based on this study provide new evidence regarding which internal organizational elements really impact healthcare sustainability. The analysis shows that healthcare sustainability needs thorough attention to multiple factors across the entire system. Long-term sustainability improvement demands organizations to create policy alignment while developing strong leadership along with workforce development and incorporation of technological tools within supportive institutional structures.

Research in the future should examine resource allocation's indirect effects simultaneously with evaluating various organizational and patient-related contextual variables and external environmental influences for better healthcare sustainability understanding.

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