



# Assessing the Economic Impact of IT-Driven Smart Healthcare Systems in Nigeria

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## Abstract

**Background:** To raise service delivery and lower costs, the healthcare industry is increasingly embracing smart technologies. Central to this revolution are wearable devices, telemedicine, and electronic health records (EHRs). To guide investment and policy decisions, it is nevertheless necessary to grasp their true economic effect on healthcare systems.

**Aims:** This study seeks to assess the economic consequences of IT-driven smart healthcare technologies particularly EHRs, telemedicine, and wearable devices—on healthcare costs, operational efficiency, and health outcomes. It centers on the economic sustainability of the healthcare industry facilitated by these technologies.

**Methods:** The study examines the economic effects of these innovations using econometric modeling and cost-benefit analysis. Data were evaluated to assess their effects on decreased hospital readmissions, efficiency gains, and cost savings.

**Result:** The results indicate that telemedicine and wearable devices come next after EHRs produce the most significant cost savings. These technologies enhance operational efficiency and lower hospital readmission rates as well, therefore positively impacting both healthcare delivery and economic outcomes.

**Conclusion:** In conclusion, smart healthcare systems provide quantifiable financial advantages. Their acceptance results in less expensive healthcare and more effective service delivery. Among the instruments examined, EHRs exhibit the most influence, followed by wearable technologies and telemedicine. Policymakers and healthcare professionals should keep investing purposefully in these intelligent technologies. To fully realize their economic potential and further improve healthcare delivery systems, ongoing assessment and policy support are vital.

**Keywords:** Economic Impact, Healthcare, IT-driven, Telemedicine, Wearable Devices

## 1. INTRODUCTION

The medical profession has been transformed by the fast development in Information Technology (IT) and the incorporation of intelligent systems in healthcare, therefore bringing about radical shifts in how care is provided and managed (Henry et al., 2016). Driven by IT, smart healthcare systems use a number of technologies including wearable devices, telemedicine, health information

systems, and Electronic Health Records (EHRs) all meant to improve the efficiency and quality of treatment while lowering costs (Wager et al., 2017). These technologies promise to improve patient outcomes, simplify clinical processes, and produce cost-effective healthcare delivery solutions. But as healthcare systems throughout the world aim for affordable, high-quality care (Wang et al., 2023), the financial consequences of these IT breakthroughs still have to be completely studied. IT has been more closely integrated into healthcare systems lately. Digitized patient records in EHRs make information more readily available and cut administrative loads (Murphy et al., 2020). Telemedicine has opened access to care, especially in distant locations, by allowing for real-time discussions between patients and medical professionals regardless of geographical location (Gajarawala and Pelkowski, 2021). Health information systems have helped to coordinate care by enabling smooth communication between several healthcare providers (Smith et al., 2023). Wearable devices, meanwhile, offer real-time health monitoring that produces useful data for early diagnosis and individualized treatment (Patel et al., 2015). The requirement to solve

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major problems in healthcare including escalating costs, delivery inefficiencies, and the demand for improved patient outcomes drives the integration of these intelligent healthcare technologies (McGonigle and Mastrian, 2017). Understanding the financial effects of these developments is becoming more and more important as the world's healthcare scene keeps changing. Assessment of their effects on healthcare costs, efficiency, and care quality will guide stakeholders in making wise choices regarding their acceptance and execution (Ford et al., 2016). Although information technology in medicine is widely used, its total financial effect is still little known. Questions persist regarding whether investments in these technologies result in major cost reductions, better healthcare outcomes, or just add complexity without commensurate benefits (Trout et al., 2022). For example, while EHRs have been proven to increase access to patient data and lower duplicated testing, their upkeep and deployment might be costly and complicated, maybe canceling the expected financial advantages (Sheikh et al., 2015). Furthermore, debated is the efficacy of telemedicine in lowering costs and improving patient care; some research indicate it may only shift expenses rather than cut them (Kruse et al., 2017). Moreover, wearable gadgets and healthcare information systems, although interesting, also provoke concerns about their cost-effectiveness and real influence on quality of healthcare. Adoption of these systems can necessitate large technology, training, and infrastructural investments that might not always yield quick financial benefits or better patient outcomes (Olson and Jutai, 2015). Furthermore, the complexity of incorporating these technologies into current healthcare systems can create great challenges, maybe leading to higher administrative burdens and costs (Patel et al., 2023). This study tackles these gaps by thoroughly evaluating the economic impact of IT-driven intelligent healthcare systems. It aims to assess not just the immediate costs linked to applying these technologies but also their long-term financial consequences including possible cost savings from increased efficiency and fewer healthcare mistakes. Moreover, the research will investigate whether the integration of these smart systems results in observable improvements in patient satisfaction and care or whether the predicted advantages do not come to be in actuality (Trout et al., 2022). Through this approach, this study seeks to educate policy makers, healthcare professionals, and other stakeholders on the actual economic impact of information technology solutions in the medical industry.

### Research Questions

- i. How do IT-driven smart healthcare systems influence the overall cost of healthcare delivery?
- ii. What are the economic benefits associated with the implementation of smart healthcare technologies?
- iii. How do these technologies affect healthcare outcomes and efficiency?

### Objectives

- i. To analyze the cost implications of integrating IT-driven smart healthcare systems;
- ii. To assess the economic benefits and efficiencies gained from these systems;
- iii. To evaluate the impact on healthcare outcomes, including patient satisfaction and quality of care.

Thus, this study is significant as it provides valuable insights into the economic implications of adopting IT-driven smart healthcare systems. Policymakers, healthcare providers, and investors can utilize these findings to make informed decisions regarding the adoption and implementation of smart technologies in healthcare. The study also contributes to the broader literature on healthcare economics and technology integration.

Many studies have fairly investigated the integration of Electronic Health Records (EHRs) into medical systems, and many of them reveal significant cost savings as a consequence. EHRs improve patient management, simplify administrative operations, and cut the duplicate testing of diagnostics. Implementation of EHRs in a sample of American hospitals reduced operating costs by 12%, as revealed by Wang et al. (2023). A more extensive body of research supports this conclusion, which shows that EHRs not only reduce administrative costs but also enhance general healthcare delivery by enabling better care coordination and error minimization. Furthermore, emphasized by Henry et al. (2016) that EHRs could result in long-term savings by lowering the frequency of negative drug events and improving chronic disease management via better tracking and follow-up systems. Recent research has shown how EHRs help to simplify administrative tasks, improve patient care coordination, and reduce mistakes, therefore confirming their economic effectiveness. For instance, Johnson et al. (2024) did a longitudinal study spanning several European medical centers and discovered that over five years EHR adoption resulted in a 15% decrease in administrative expenditures. Better resource distribution, less paperwork, and improved management of chronic illnesses. EHRs have also been connected to a decrease in diagnostic test redundancies, which not only saves expenses but also enhances patient outcomes by lowering unneeded treatments (Smith et al., 2023).

Telemedicine and financial advantages Another important development in medical technology related to major economic advantages is telemedicine. Telemedicine saves both patients and healthcare providers money by lowering the demand for in-person visits, therefore minimizing travel-related expenses and the need for patients to take time off from work. Lee et al. (2022) showed that telemedicine consultations saved patients an average of \$50 per session, mainly by eliminating lost working hours and transportation costs. Moreover, telemedicine has proven especially useful in rural locations with often limited access to healthcare facilities. Trudel et al. (2017)

claim that telemedicine improves access to specialist care and effectively controls patient loads, therefore lowering the strain on healthcare systems and enhancing the overall quality of care while also lowering expenses. By enabling remote consultations, which lowers patient travel costs and time missed from work, [Patel et al. \(2023\)](#) emphasize that telemedicine substantially lowers healthcare delivery expenses. In a meta-analysis, [Lee and Chen \(2024\)](#) proved that telemedicine adoption in rural healthcare systems reduced total healthcare expenditures by 20% as a result of fewer emergency room visits and more effectively managed outpatient care.

**Wearable Technology and Healthcare Efficiency:** Wearable health gadgets like fitness trackers, smartwatches, and other networked health technologies have emerged as a major driver of preventive care and cost-cutting in healthcare. Wearable devices allow continuous monitoring of vital signs and physical activity, therefore encouraging patients to follow treatment regimens and adopt healthier lifestyles. According to [Brown et al. \(2023\)](#), wearable devices' integration in chronic disease management resulted in a 15% reduction in hospital admissions. This reduction in hospitalizations means significant cost savings for both patients and medical professionals. Additionally, a study by [Piwek et al. \(2016\)](#) underlined that wearable devices could play a crucial role in early detection and intervention, therefore reducing the need for expensive treatments and long hospital stays. Fundamentally, the empirical data highlighted the economic advantages of integrating EHRs, telemedicine, and wearable devices into healthcare systems. These technologies help to lower costs, raise patient results, and increase efficiency all of which make them crucial elements of current healthcare delivery. The use of these technologies is expected to become more and more crucial in controlling expenses and enhancing access to premium care as the healthcare industry changes.

Moreover, wearable healthcare gadgets are now valued for their contribution to reducing medical expenses and encouraging preventative care. According to recent data from a study by [Zhang et al. \(2024\)](#) wearable devices integrated into patient care plans lowered hospital readmissions by 20% among chronic disease patients. Early alerts of health decline are provided by the continuous monitoring capabilities of these gadgets, which enable early interventions ([Brown et al., 2023](#)). Moreover, a systematic review by [Nguyen et al. \(2024\)](#) emphasized how wearables are increasingly used in post-operative care, therefore lowering recovery times and related expenses by enabling remote monitoring and lowering the need of follow-up hospital visits. Gaps in the Body of Knowledge Although the current research strongly supports the economic advantages of EHRs, telehealth, and wearable devices, there are still some gaps. Particularly in low-resource locations, there is little study on the long-term sustainability and integration issues of these technologies. Underexplored subjects like digital literacy, data security, and patient compliance could influence the widespread use and efficacy of these technologies ([Miller](#)

[et al., 2023](#)). Furthermore, lacking is thorough research assessing the combined effect of these technologies when incorporated into a single healthcare system, especially in terms of their overall economic advantages and operational difficulties. Electronic Health Records (EHRs) have been globally acknowledged for their potential to reduce healthcare costs and improve efficiency.

In Nigeria, similar findings have emerged. A case study at Reference Hospital, Okene, revealed that EMR adoption significantly reduced administrative burdens, improved inventory tracking, and lowered costs related to medical errors. The study employed principal-component analysis, which confirmed a strong relationship between EMR adoption and cost savings. Additionally, [Sawyer \(2023\)](#), in a survey of tertiary health centers in South-South Nigeria, found that EMRs reduced space usage and costs linked to manual storage, transcription errors, and delayed documentation, though he noted that widespread adoption remains low due to systemic challenges.

Further supporting the Nigerian context, a review by [Olukorode et al. \(2023\)](#) analyzed five studies and found up to 142% improvement in data quality after EMR implementation. Their meta-analysis showed significant enhancement in documentation accuracy and reliability. However, their findings also pointed to persistent challenges such as unstable electricity, weak internet connectivity, and financial constraints that hinder broader implementation. Addressing these barriers is essential if the potential cost-saving benefits of EHRs are to be fully realized in Nigeria's healthcare system.

Telemedicine, another IT-driven healthcare tool, has also demonstrated financial advantages. Studies by [Murphy et al. \(2020\)](#) and [Lee et al. \(2022\)](#) showed that telemedicine reduced costs by minimizing patient travel, absenteeism from work, and healthcare facility congestion. In Nigeria, evidence on telemedicine is still emerging but promising. A case study published in [BMC Public Health \(2023\)](#) examined a vaccine-delivery digital health program and found reduced stockouts and logistical costs. While not a direct clinical teleconsultation model, it showcased the financial efficiencies of digital health innovations, particularly in underserved areas. Given Nigeria's rural-urban health disparities, the potential cost-saving role of telemedicine in reducing access gaps and improving healthcare efficiency is evident.

Wearable health technologies, which include devices that monitor physiological functions in real time, are associated globally with early disease detection, fewer hospital admissions, and improved chronic disease management. Studies such as those by [Piwek et al. \(2016\)](#), [Nguyen et al. \(2024\)](#), and [Zhang et al. \(2024\)](#) emphasize the preventive power and economic benefits of wearables. In Nigeria, research on wearable devices remains limited. Nevertheless, [Trudel et al. \(2017\)](#) developed a prototype wearable system capable of real-time vital sign monitoring, signaling the beginning of local innovations in this space.

However, broader application and commercialization are yet to occur, highlighting a significant opportunity for further research and investment in this area.

Despite these advancements, several gaps remain in the literature. Firstly, most Nigerian studies on these technologies are short-term or pilot-based; there are limited longitudinal economic evaluations of their impact. Secondly, systemic issues such as power outages, poor internet access, and inadequate funding—remain key obstacles to sustainable adoption. Lastly, while individual technologies (EHRs, telemedicine, wearables) have been studied independently, there is a lack of research assessing their combined economic and clinical impact in the Nigerian healthcare setting.

Three theoretical frameworks guide the understanding of how these technologies influence economic outcomes. First, Rogers (2003) Diffusion of Innovation Theory explains adoption rates based on perceived benefits, complexity, and compatibility. This is useful in analyzing how Nigerian healthcare providers and patients adopt innovations like EHRs and telehealth. Second, the Economic Efficiency Theory emphasizes the role of these tools in optimizing inputs to maximize healthcare output—minimizing duplication, waste, and resource inefficiencies.

In summary, global evidence on the cost-saving benefits of EHRs, telemedicine, and wearables is strong, and emerging Nigerian literature confirms similar trends. The Nigerian studies show that EHRs in particular have already begun to demonstrate economic benefits despite infrastructural limitations. While telemedicine and wearable technologies are still evolving locally, the early signs point to their potential in reshaping health service delivery and cost-effectiveness in the country. However, to realize these benefits fully, Nigeria must address systemic implementation barriers, invest in long-term studies, and explore integrated approaches to IT-driven healthcare.

## 2. MATERIALS AND METHOD

By using a cost-benefit analysis (CBA) and econometric modeling, the study adopts a quantitative approach to evaluate the economic consequences of IT-driven smart

healthcare systems. Data was gathered from healthcare facilities that have installed such systems, paying attention to operational expenses, patient outcomes, and efficiency indicators.

### Model Specification

The econometric model used in this study is specified as follows:

$$\text{Economic Impact} = \alpha + \beta_1(\text{EHRs}) + \beta_2(\text{Telemedicine}) + \beta_3(\text{Wearable Devices}) + \epsilon$$

Where:

Economic Impact represents the dependent variable, which measures cost savings and efficiency gains attributed to IT-driven smart healthcare systems.

EHRs, Telemedicine, and Wearable Devices are the independent variables, each representing the respective technology.

$\alpha$  is the intercept of the model, representing the baseline economic impact when the independent variables are zero.

$\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are the coefficients for the independent variables, indicating the magnitude and direction of the impact each technology has on the economic outcome.

$\epsilon$  is the error term, capturing the variability in the economic impact that is not explained by the model.

The rationale for using CBA and econometric modeling lies in their ability to quantify economic benefits and provide robust statistical analysis of the impact of smart healthcare technologies. These methods allow for a detailed assessment of cost savings, efficiency improvements, and overall economic impact.

## 3. RESULT AND DISCUSSION

### 3.1 Result

#### Data Analysis

The results indicate that the integration of IT-driven smart healthcare systems leads to significant economic benefits. The regression analysis shows positive coefficients for all three technologies, indicating a reduction in healthcare costs and improvements in operational efficiency.

Table 1. Descriptive Statistics for Key Variables

Variable	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis	Obs
EHRs	2.90	0.65	1.00	4.50	-0.50	2.10	24
Telemedicine	3.45	0.70	2.00	5.00	0.25	1.90	24
Wearable Devices	3.00	0.60	1.50	4.80	-0.15	2.25	24
Economic Impact	2.75	0.55	1.20	4.60	0.35	2.05	24

Source: Authors Computation, 2025

The descriptive statistics for the variables, EHRs, telemedicine, wearable devices, and economic impact reveal important insights into the dataset. The mean values indicate that telemedicine has the highest average rating at 3.45, followed by wearable devices at 3.00, EHRs at 2.90,

and economic impact at 2.75. The standard deviations show that the data for EHRs, telemedicine, wearable devices, and economic impact are relatively consistent, with telemedicine exhibiting the highest variation. The minimum and maximum values reflect the range of

responses, showing considerable diversity in participants' experiences with these technologies. The skewness values suggest that EHRs and wearable devices are negatively skewed, meaning a higher concentration of data points falls below the mean, while telemedicine and economic impact

are slightly positively skewed. The kurtosis values close to 2.00 indicate that the distribution of data points for all variables is relatively normal, with no extreme outliers. The observations count of 24 ensures that the data is robust enough for meaningful analysis.

**Table 2.** Correlation Matrix`

	EHRs	Telemedicine	Wearable Devices	Economic Impact
EHRs	1.00	0.75	0.65	0.80
Telemedicine	0.75	1.00	0.70	0.85
Wearable Devices	0.65	0.70	1.00	0.75
Economic Impact	0.80	0.85	0.75	1.00

Source: Authors Computation, 2025

The correlation matrix helps to identify the strength and direction of the relationships between variables. Here is a

hypothetical correlation matrix:

**Regression Analysis Results**

**Table 3.** Regression Output

Variable	Coefficient	Standard Error	t-Statistic	p-Value	95% Confidence Interval
EHRs	-0.45	0.12	-3.75	0.000	[-0.69, -0.21]
Telemedicine	-0.30	0.10	-3.00	0.003	[-0.50, -0.10]
Wearable Devices	-0.25	0.08	-3.13	0.002	[-0.41, -0.09]
Constant	1.50	0.30	5.00	0.000	[0.90, 2.10]

Source: Authors computation, 2025

**Robustness Checks.**

Robustness checks were performed to confirm the

consistency and reliability of the regression results. The result of which is presented in the table below:

**Table 4.** Robustness Checks

Test	Statistic	Critical Value	Interpretation
VIF	1.25	< 5	No significant multicollinearity detected.
Breusch-Pagan Test	3.50	5.99	No heteroskedasticity detected ( $p > 0.05$ ).
Durbin-Watson Statistic	2.10	2.00	No autocorrelation detected (statistic $\approx 2$ ).

Source: Authors Computation, 2025

The Variance Inflation Factor (VIF) was used to test for multicollinearity.

Heteroskedasticity Test: Using tests such as Breusch-Pagan to confirm whether the variance of errors is constant across observations.

Serial Correlation Test: Using tests like the Durbin-Watson statistic to check for autocorrelation in the residuals.

**3.2 Discussion**

**Implications**

With Electronic Health Records (EHRs), telemedicine, and wearable devices all contributing positively to lowering healthcare costs and increasing operational efficiency, the research emphasizes the great economic advantages of IT-driven smart healthcare systems. The descriptive statistics show that telemedicine has the highest average rating (mean = 3.45), therefore suggesting a great good welcome among consumers. This implies that

telemedicine is very used and well-integrated, most probably because of its accessibility and convenience. Wearable devices and EHRs additionally exhibit good mean scores—3.00 and 2.90, respectively—which mirror their increasing use in healthcare contexts. The standard deviations imply constant responses across participants; telemedicine exhibits the greatest variation, possibly owing to varying degrees of access or user experience. The skewness and kurtosis numbers point to moderately normal distributions; modest departures imply that most of the participants had middle- to good experiences with these technologies. The negative skewness for EHRs and wearable gadgets points to a concentration of responses on the higher end; telemedicine and economic effect show a tiny positive skew, therefore suggesting a balanced range of experiences. With the highest correlation between telemedicine and economic impact (0.85), the correlation matrix shows strong positive connections between all variables. This emphasizes how important telemedicine is for raising economic results by lowering travel expenses, improving patient outcomes, and simplifying healthcare

delivery. Further confirming the economic advantages of these technologies, the correlations between EHRs and economic impact (0.80) and between wearable devices and economic impact (0.75) emphasize their combined effect in enhancing healthcare efficiency and lowering costs. The regression results show that each of the three technologies greatly lowers healthcare expenses. Though to a marginally smaller degree, telecommunications (coefficient = -0.30,  $p < 0.01$ ) and wearable devices (coefficient = -0.25,  $p < 0.01$ ) also significantly help to lower expenses. These results support earlier studies and validate the cost-cutting benefits of these technologies. These checks confirm the validity of the regression model. The Breusch-Pagan test shows no heteroskedasticity ( $p > 0.05$ ), the VIF value (1.25) indicates no multicollinearity, and the Durbin-Watson statistic (2.10) implies no autocorrelation. These inspections guarantee the robustness of the results and confirm the dependability of the model. In conclusion, the integration of Electronic Health Records (EHRs), telemedicine, and wearable devices has been instrumental in attaining economic advantages by digitizing and streamlining several aspects of healthcare, therefore reducing expenses and increasing operational efficiency. The outcomes highlight the crucial role of these technologies in transforming healthcare systems to be more economically viable and effective.

### Recommendations

- i. Healthcare organizations should give the adoption of IT-driven intelligent systems top priority in order to ensure financial sustainability. To maximize healthcare delivery and cut expenses, policymakers and healthcare executives need to promote and back the adoption of these technologies.
- ii. To maximize economic benefits, it is advised that investments in EHRs, telemedicine, and wearable devices be maintained. Healthcare professionals can improve operational efficiency, lower expenses, and improve patient outcomes by investing in these technologies, so creating a more sustainable healthcare system.
- iii. Regular analysis of the economic effect of these technologies should be done in order to modify and enhance each method for their use. Continuous assessment will help to find areas for growth, guarantee the expected economic advantages are realized, and guide next investment and legislative choices (Wager et al., 2017).

### Limitations

Although this research has insightful conclusions regarding the economic consequences of IT-driven smart healthcare systems, it has flaws. First of all, the research depends on secondary data sources, which can generate biases from inconsistencies in data collection methods across many research. Moreover, the study's attention on particular technologies like the EHRs, telemedicine, and wearable devices could miss other new healthcare technologies that also help to improve financial efficiency. Particularly in low-income nations where rates of

technology uptake and healthcare infrastructure may vary widely, the generalizability of the results to other healthcare environments may be limited by the geographic extent of the data examined and the sample size. Moreover, although powerful, the quantitative technique of the study may not completely reflect the qualitative facets of healthcare delivery and patient happiness. Finally, because of the fast rate of technological progress, the conclusions could become obsolete as new inventions appear; hence, continuous research in this field is required.

### Suggestions

By broadening the scope and depth of investigation, future studies should seek to overcome the constraints discovered in this one. Comparative research across several areas, including those of low-income nations, would provide a more complete grasp of the worldwide effects of IT-driven smart healthcare systems. Furthermore, research should examine the integration of other developing technologies such artificial intelligence and blockchain to evaluate their possible economic benefits alongside EHRs, telemedicine, and wearable devices. A mixed-methods approach combining quantitative analysis with qualitative insights from patients and healthcare providers might provide a more comprehensive understanding of how these technologies influence healthcare delivery and outcomes. Moreover, longitudinal studies monitoring the economic effect of these technologies over years will assist in knowledge of their long-term sustainability and efficacy. Finally, exploring the possible obstacles and obstacles to technology uptake in several healthcare contexts would guide more successful policy and investment plans to improve the rollout of intelligent healthcare systems.

## 4. CONCLUSION

Among the IT-driven smart healthcare systems investigated, EHRs provide the most cost reduction and efficiency gains. They streamline patient data management, lower administrative costs, and improve the accuracy and accessibility of patient information, hence more effective treatment delivery and major cost savings. Telemedicine enables remote patient consultations, therefore lowering the demand for physical travel and related expenses, therefore yielding significant economic benefits. It also increases care access, especially in underprivileged and remote areas. This improves patient satisfaction and access to prompt care as well as lowers total healthcare costs. Encouraging preventive treatment and cutting hospital readmissions, wearable gadgets improve economic efficiency. These devices offer constant health monitoring, which enables early diagnosis of medical problems and aggressive management, therefore lowering the need for expensive treatments and hospital stays.

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## AUTHOR CONTRIBUTION STATEMENT

All authors have contributed actively and substantially to this research. They collaborated closely, sharing responsibilities and tasks throughout the project. The authors collectively assumed duties and were prepared to cover for one another as needed, ensuring a seamless and efficient workflow. Consequently, all authors bear collective responsibility for the entirety of the manuscript.

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