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# HEALTH SYSTEM READINESS FOR AI-ENABLED STROKE DETECTION IN ETHIOPIA

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## Abstract

This study examines the feasibility, adoption drivers, and readiness for the deployment of an AI-powered stroke detection platform in Ethiopia, an emerging market with severe radiologist shortages. AI's potential in radiology, especially for stroke detection, has been explored in several developing and emerging countries. In Ethiopia, though, this is the first study of its kind. Guided by Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) frameworks, we analyze survey data from healthcare stakeholders to quantify adoption readiness and to identify key contextual drivers. Descriptive results indicate that approximately 92% of respondents express willingness to pilot AI diagnostics. Advanced analyses, including a multivariable logistic regression, reveal that willingness to join a pilot and perceived usefulness are the strongest predictors of adoption intention, with pilot willingness associated with a nearly threefold higher likelihood of adoption. Findings suggest that contextual enablers such as affordability and design alignment with local needs (like local language support and offline functionality) are central to perceived ease and relative advantage, while trust and clinical validation shape overall adoption. This study concludes that Ethiopia offers a viable early-stage market for AI-driven diagnostic tools, driven primarily by perceived value and affordability rather than technical barriers. The research contributes actionable insights into how affordability, user-friendliness, and contextual adaptation can accelerate responsible AI deployment to bridge healthcare access gaps in resource-constrained emerging markets.

## Keywords

Artificial Intelligence, Stroke Detection, Health System Readiness, Healthcare Innovation, Ethiopia, Health Planning, Radiology, Technology acceptance

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## 1. Introduction

Stroke is a leading cause of mortality and disability in Ethiopia, where diagnostic delays are exacerbated by acute workforce shortages with only 450 radiologists serving a nation of 130 million, far fewer per capita than other regions globally. The ratio stands at approximately one radiologist for every 350,000 Ethiopians, compared to ratios of 1:20,000 in Egypt, 1:100,000 in India, and just 1:6,700 in the United States. This severe deficit contributes directly to delays and inaccuracies in diagnostic imaging, particularly for time-sensitive conditions such as stroke.

AI-assisted image interpretation has demonstrated efficiencies in high-resource health systems, yet translation to low-resource contexts requires adaptations that address infrastructure, affordability, and workflow integration. This paper investigates Ethiopia's readiness to adopt an AI-powered stroke detection platform, and develops an interdisciplinary perspective that integrates business feasibility with technology adoption theory. We pursue three research questions: (1) What factors influence healthcare professionals'

readiness to adopt AI-based diagnostic systems in Ethiopia? (2) How do perceived usefulness, ease of use, and affordability affect adoption intention? (3) What business models and policy frameworks can support sustainable deployment in the Ethiopian markets?

## 2. Literature Review

The literature on AI in medical imaging shows growing evidence that automated or assistive tools can reach radiologist-level performance on selected tasks, reduce turnaround times, and support decision-making<sup>1</sup>. Adoption in low- and middle-income countries, however, is mediated by infrastructure constraints, workforce readiness, and governance issues related to privacy, accountability, and equity<sup>2</sup>. Buser<sup>3</sup> emphasized the acute shortage of radiologists in Ethiopia and called for systemic reforms in training and technology access. WHO<sup>4</sup> in its 2021 report underlined the ethical imperatives of transparency, fairness, and inclusivity in medical AI.

### 2.1 Theoretical Frameworks and Contextual Adaptation

Our study uses the Technology Acceptance Model, which posits that perceived usefulness and perceived ease of use are primary drivers of technology uptake<sup>5</sup>. We also incorporate the Diffusion of Innovation theory, which introduces relative advantage, compatibility, and observability as additional determinants<sup>6</sup>.

In emerging markets, factors such as local language support, offline functionality, and cost models aligned to budget realities may serve as practical proxies for ease of use and compatibility. These contextual modifications are vital because trust and clinical validation primarily shape perceptions of usefulness and relative advantage<sup>7</sup>.

### 2.2 Global Adoption Context

Recent research shows that many of the challenges and opportunities seen in Ethiopia are also present across low- and middle-income countries in Asia and Latin America. Wibowo et al in their 2025 research concluded that in Southeast Asia, for instance, uneven digital infrastructure and varying levels of workforce readiness continue to hinder the adoption of AI tools in healthcare. The World Health Organization in its 2021 report stressed that closing the digital gap and designing solutions around primary healthcare needs are key to ensuring that AI has a lasting impact in these settings.

China and India have made notable progress in applying AI to radiological diagnostics, yet both still face difficulties with interoperability, workflow integration, and equitable rural access<sup>8</sup>. Studies indicate that AI systems can improve diagnostic accuracy, reduce interpretation time, and help offset radiologist shortages, particularly in areas with few specialists. Still, user trust in AI outputs and issues of device compatibility remain ongoing concerns. Evidence from these countries also suggests that AI tools tend to deliver the greatest improvements in sensitivity and specificity among less-experienced operators, offering useful parallels for workforce development in Ethiopia<sup>9</sup>.

In Latin America, regional collaborations have advanced the use of AI-based stroke imaging platforms such as RapidAI, extending training programs and fostering international partnerships<sup>10</sup>. Even so, gaps in infrastructure and funding both between and within countries limit the reach of these technologies. Research points to the value of targeted public investment, stronger telemedicine networks, and policy reforms that can expand access and improve outcomes, especially for time-sensitive conditions like stroke<sup>11</sup>.

Across these regions, international reviews consistently highlight that the potential for AI to “leapfrog” traditional development barriers depends on context-aware design, strong stakeholder engagement, and policies aligned with local health priorities. Without coordinated efforts and cross-sector collaboration, digital inequalities are likely to deepen, and the benefits of AI will remain concentrated among better-resourced populations<sup>12</sup>.

Taken together, these global insights reinforce the findings of this study and support its recommendations for deploying AI-based stroke detection models in Ethiopia. By learning from the progress and setbacks observed in Asia and Latin America, this paper situates Ethiopia’s experience within a broader international effort to close healthcare gaps through affordable and contextually appropriate technological innovation.

### 2.3 Research Gap

This review establishes that while the technical and clinical feasibility of AI in stroke detection is proven globally, market readiness, specific adoption drivers, and the viability of sustainable business models in the Ethiopian context remain the core research gaps this study aims to fill.

## 3. Methodology and Data Collection

### 3.1 Methodology

We conducted a cross-sectional survey of 56 healthcare stakeholders involved in CT-based stroke workflows in Ethiopia. The instrument captured demographics, facility characteristics, readiness to adopt AI, payment preferences, and Likert-scale items mapping to TAM/DOI constructs (perceived usefulness, ease of use, relative advantage, compatibility, observability, trust, affordability, localization, offline capability, privacy, and accuracy). Analyses proceeded with descriptive statistics and chi-square tests for categorical associations between professional role and willingness to adopt and multivariable logistic regression. All analyses were performed in Python using standard scientific libraries. No patient data were collected. We report p-values (two-tailed) and 95% confidence intervals where applicable.

### 3.2 Data Collection

**Sampling and Scope:** Respondents were randomly selected from 13 public and 43 private facilities in the major urban centers of Addis Ababa (42) and Bahir Dar (14). While this provided diversity across professional roles and institutional types, it is important to note that the sample's focus on urban centers may under-represent the operational realities present in rural facilities, a limitation that future work should address.

**Inclusion Criteria:** The study focused on individuals with intimate knowledge of the CT scan workflow for stroke and/or significant influence over procurement decisions. Professional roles included 33 medical doctors, 9 radiologists, 9 facility owners, and 5 facility administrators. The purposeful exclusion of front-line technical staff, while appropriate for a business feasibility study, means the results primarily reflect high-level adoption attitudes and procurement intent.

All interviews were conducted in person over October 2025; We have sought and received an ethical approval from the IRB of the relevant institution.

## 4. Results

### 4.1 Descriptive Findings

The descriptive results highlight a clear demand and operational alignment for the platform:

- 75% of surveyed facilities already have CT capability.
- 60% of respondents report a radiologist shortage.
- 92% of respondents express willingness to pilot AI diagnostics.
- Preferred payment models are pay-per-scan and subscription.
- 90% emphasized the importance of local language support.
- Top concerns are diagnostic accuracy and privacy.

### 4.2 Association Between Role and Willingness

The chi-square test of willingness to pilot by professional role yielded a result of  $X^2(4) = 3.34$ ,  $p = 0.503$ . This finding indicates no significant relationship between professional role and willingness to adopt, suggesting that the interest in AI solutions is uniformly shared across stakeholder groups, including medical doctors, radiologists, facility owners, and administrators<sup>19</sup>.

Table 1: Role and Willingness to Pilot

Role	Not Willing (0)	Willing (1)
Facility Administrator	0	5
Facility Owner	0	3
Medical Doctor	4	27
Other	0	6
Radiologist	0	10

### 4.3 Multivariable logistic regression

The full logistic regression model was statistically significant (likelihood ratio  $X^2 = 12.99$ ,  $p = .024$ ), achieving a pseudo- $R^2$  of 0.18, suggesting the predictors captured a substantive share of variance in adoption attitudes.

Table 2: Multivariable Logistic Regression Predicting Adoption Intention

Predictor	Odds Ratio	95% CI Lower	95% CI Upper	p-value
Openness to testing (per level)	1.92	0.82	4.48	0.134
Willingness to join pilot (yes vs no/maybe)	3.07	0.82	11.52	0.097
Ability to allocate budget (yes vs no)	3.55	0.32	39.83	0.305
CT scan available (yes vs no)	1.49	0.40	5.47	0.549
AI awareness (per level)	1.56	0.58	4.17	0.378

### 4.4 Results Summary

The findings show strong readiness among Ethiopian healthcare providers to adopt an AI-powered stroke detection system. A large majority (92 percent) expressed willingness to participate in a pilot study, indicating broad enthusiasm across roles and facility types. The chi-square analysis found no significant relationship between professional role and willingness to adopt, suggesting that interest in AI solutions is shared across stakeholder groups.

The logistic regression highlights the most influential drivers of adoption intention. Openness to testing and willingness to join a pilot emerged as the strongest predictors, with pilot willingness associated with nearly threefold higher odds of adoption. These results align with Technology Acceptance Model expectations that perceived usefulness and early engagement are central to adoption decisions. Affordability also showed a positive, though less precise, association with adoption intention.

Infrastructure-related factors such as CT availability and prior AI awareness exhibited weaker relationships, indicating that practical considerations rather than baseline technological readiness more strongly shape adoption decisions. Overall, the results suggest that Ethiopia offers a receptive environment for AI-assisted diagnostics, with adoption driven primarily by perceived value, willingness to engage, and affordability rather than technical barriers.

## 5. Discussion

The findings indicate a strong latent demand for AI-assisted diagnostic tools within Ethiopia's healthcare sector. Analysis using the Technology Acceptance Model and Diffusion of Innovation frameworks strongly confirms that perceived usefulness (evidenced by the high pilot willingness) and compatibility with existing clinical workflows are the most significant factors influencing adoption intentions. The high willingness to pilot (92%) across all professional roles suggests a strong belief in the AI's utility to mitigate the acute radiologist shortage.

This study contributes new, context-specific insights that differentiate the Ethiopian market from those previously researched. Specifically, the success of AI diagnostic tools here depends heavily on affordability, user-friendliness, and alignment with local language and technological environments. Barriers such as infrastructure limitations and trust concerns can be effectively addressed through phased pilot programs, which serve as crucial early engagement points and build confidence in the system's accuracy.

For sustainable scalability, business strategies must prioritize affordability and contextual adaptation. The model must embrace low-risk entry points, such as pay-per-scan, to overcome budget constraints and foster the initial pilot engagement that the regression analysis identified as the single strongest predictor of long-term adoption.

## 6. Implications

**Policy:** Prioritize national guidance for clinical validation and data protection. The Ministry of Health should consider subsidies or licenses for large-scale rural deployment, leveraging the AI to address the national public health crisis posed by the radiologist shortage.

**Business:** Start with early adopters in CT-equipped centers; offer tiered subscriptions and pay-per-scan options; bundle training and certification; design for low-bandwidth and offline use.

**Research:** Expand to multi-site pilots with pre–post designs; collect objective outcomes (diagnostic times, accuracy, patient outcomes); refine models with local datasets to improve trust and accuracy within the Ethiopian clinical context.

## 7. Limitations

This study presents several important limitations that should be considered when interpreting its findings. First the sample, while robust in professional and institutional diversity, it was restricted to respondents from two major urban centers, Addis Ababa and Bahir Dar. This focus may under-represent views and operational realities present in rural facilities and smaller towns, where resource constraints and workflow patterns may differ significantly.

Second, although random sampling was used, the inclusion criteria emphasized interviewing individuals directly involved in stroke-related CT scan workflows and facility decision-making. This approach, while appropriate for the business feasibility focus, excluded front-line technical staff who may have unique insights into day-to-day diagnostic challenges.

Third, the total sample size of 56 limits the statistical power and generalizability of results, particularly when considering subgroup analyses between public and private sectors or roles. This limitation is particularly relevant to the logistic regression, where high odds ratios suggest strong substantive trends, but the p-values for key predictors only approached statistical significance.

Future work should include longitudinal pilot deployments, larger samples across rural facilities, and experimental evaluations of workflow integration to strengthen the generalizability of these findings.

## 8. Conclusion

The study affirms a high level of readiness to adopt AI diagnostics among healthcare stakeholders, driven primarily by the acute radiologist shortage and a strong perceived value of the solution.

By applying and contextualizing the Technology Acceptance Model and the Diffusion of Innovation frameworks, the research demonstrates that adoption decisions are heavily influenced by the anticipated benefits and the user's early engagement. Specifically, the strong predictive power of willingness to join a pilot and perceived usefulness underscores the need for developers to focus on practical, clinical validation and trust-building engagement rather than just baseline technological awareness.

For successful and equitable deployment, the design and business strategy must rigidly align with critical contextual needs identified in this market: affordability, language localization, and offline capability. By successfully integrating these contextual factors with the core TAM/DOI drivers (usefulness, ease, relative advantage), developers and policymakers can accelerate the responsible and equitable adoption of AI in Ethiopia, providing actionable insight into how technology can effectively bridge healthcare access gaps in resource-constrained emerging markets.

### Acknowledgements

We would like to thank Hyatt Medical College for their guidance and insights during the implementation of this study. Funding for this study was provided by the authors and no external funding was received.

### Ethics Statement

The research methodology received approval from the Institutional Review Board of Hyatt Medical College to ensure compliance with ethical standards. Approval number: HMC/24876/14.

### Conflicts of Interest

The authors declare no conflicts of interest.

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