Journal: Texila International Journal of Medicine
Publisher: Texila International Journal
ISSN: 2520-3118
Volume 9 Issue 1, 2026
DOI: 10.21522/TIJMD.2013.09.01.Art001

Factors that Predict the Adoption and Sustained Use of the Electronic Community Health Information System Over Time in Nyatike and Awendo Sub-Counties, Migori County, Kenya using TAM Framework

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Abstract

Electronic Community Health Information System (e-CHIS) are increasingly adopted, However, evidence explaining the factors driving their initial uptake compared to those sustaining long-term use continues to be inadequate and neglects contextual nuances. This study explored the predictors of initial adoption and sustained use of e-CHIS among healthcare providers in Migori, with a focus on temporal variations in influencing factors and sub-county disparities, guided by the Technology Acceptance Mode (TAM). Cross-sectional design was employed. Quantitative data were obtained from 357 healthcare providers, complemented by qualitative insights from 14 key informant interviews and 25 focus group discussions. Binary logistic regression identified predictors of initial adoption, linear regression examined determinants of sustained use intention. The adoption rate was remarkably high (94.7%). A distinct temporal pattern was observed: Perceived Usefulness was the only significant psychological predictor of initial adoption (OR = 5.631, p = 0.008), though its internal consistency was modest (α = 0.552). In contrast, Perceived Ease of Use (B = 0.541, p < 0.001) was the strongest determinant of sustained use intention, explaining 71.9% of the variance. Social Influence predicted sustained use (p < 0.001) but not initial adoption (p = 0.089). Geographical disparities were the most powerful overall predictor, with providers in Nyatike over 14 times more likely to adopt e-CHIS (OR = 13.880, p = 0.019) than those in Awendo. Demographic characteristics (age, gender, education, and experience) were not significant predictors. The study calls for enhanced training, further research, and policy integration to strengthen e-CHIS adoption and sustainability in Migori.

Keywords: *Adoption, Electronic Community Health Information System, Intention to Use, Perceived Ease of Use, Sustainable Use, TAM.*

Introduction

The Electronic Community Health Information System (e-CHIS) enables healthcare providers to collect, store, manage, and analyze community health data to improve both patient care, research, and service quality [1]. e-CHIS consists of integrated digital platforms that enhance health service delivery, management, and performance monitoring. These systems connect community health promoters, healthcare facilities, sub-county and county health management teams, thereby strengthening community-level healthcare delivery [2].

The experiences of Migori County, and specifically those of Nyatike and Awendo Sub-Counties, have demonstrated both the opportunities and challenges experienced in similar low-resource settings across Africa. Understanding determinants of both digital health practices and social behavioral change is

Received: 03.11.2025 ***Accepted: 11.12.2025*** ***Published on: 23.01.2026***
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essential not only for sustaining effective health practices within the contexts, but also for generating applicable and transferable learnings for global digital health implementation. As such, our core objective of this research is to identify and understand the factors that improve the adoption and sustained use of the e-CHIS in Migori County, Kenya, and more specifically Nyatike and Awendo Sub-Counties.

Predicted adoption and sustainability factors considered include electricity access and network connectivity, health policy environment, health care providers' technology competence, and reward mechanisms of the organizations studied. Alongside these predictors, we also explored the factors that competitively affect the adoption, use and perceived ease of use, and intention to use and thus, clarified how each determinant contributed to the public health service delivery. As a part of this study, we also identified service provision gaps that comprised under-training, weak e-CHIS integration with other health systems, low frequency of use, inconsistent technical support, and weak economic system or service provision gaps, all of which have to be addressed to improve implementation.

To date, no comprehensive assessment has been conducted in Migori County to determine the factors influencing e-CHIS adoption, sustained use, or their effect on performance indicators within Nyatike and Awendo Sub-Counties. The development of e-CHIS has significantly transformed healthcare globally by improving accessibility, quality, and efficiency through technological innovation.

Kenya has embraced e-CHIS strategies to enhance and modernize its healthcare system. The Ministry of Health emphasizes that e-CHIS adoption reflects a commitment to using technology to enhance healthcare delivery, particularly in rural areas [3]. Migori County, with its mix of urban and rural contexts illustrates both these challenges and broader healthcare disparities. According to [4]. Nyatike exhibits the lowest health service performance compared to Awendo, varying according to contextual factors. Infrastructure challenges such as limited electricity and poor network connectivity remain major barriers to e-CHIS adoption in Migori [5].

Although adoption at the national level has been reviewed [6]. Significant gaps concerning the unique needs of community health promoters persist, especially in rural settings like Migori County. Even though implementation continues to face operational barriers, previous studies in Kenya [7] indicate that e-CHIS adoption improves efficiency. Key constraints include unreliable internet and inconsistent electricity, which are problematic in remote areas [8]. Poor connectivity and inadequate power supply often disrupt data entry and frustrate healthcare providers, limiting system effectiveness. Additionally, insufficient training and technical support remain significant challenges for both healthcare workers and the community members [9].

The system is being stepped up for use throughout the nation as part of the broader strategy to increase access to healthcare in pursuit of universal health coverage. Research on technology adoption demonstrates that reaching a stable state of use may be short-lived, as progress is dependent upon changing expectations of users, alternative solutions, and user experiences. Sustained use may relate to perceived usefulness and ongoing access to training. In goal-setting sustainability, it is important to monitor perceptions and promote lifelong learning for digital technologies [10]. Still, the limited resources and technical expertise for sustaining long-term use remains a barrier, since it creates complications in maintenance, upgrades and replacements [11]. The Technology Acceptance Model (TAM) consistently proves to be a viable, straight forward and suitable theory for intending-users across digital health settings.

As in other parts of Kenya, Nyatike and Awendo Sub-Counties face various challenges within the community health system including weak performance management frameworks, a shortage of community health promoters, inadequate supervision, insufficient data tools, complex reporting processes, inconsistent reporting standards, and limited refresher training for health providers. Over reliance on paper-based systems has resulted in low quality data, weak accountability, and frequent misuse of data, emphasizing the need for digital alternatives. e-CHIS implementation has the potential to significantly improve healthcare quality, equity and efficiency especially in rural and underserved areas. This study therefore sought to assess adoption, sustainability, perceived ease of use, and intention to use e-CHIS in order to enhance community health outcomes, reduce inequalities, and inform data-driven health planning and policy development. In Kenya, the healthcare system employs several Health Information Systems (HIS) nationally and within Migori County to address service delivery challenges. These include the Kenya Health Information System (KHIS), Logistics Management Information Systems (LMIS), Electronic Medical Record (EMR) systems, Laboratory Information Systems (LIS), and the Kenya Health and Research Observatory (KHRO), among others [12]. These digital tools have replaced many manual systems, yet over reliance on paper-based data collection persists, resulting in substandard referrals, inconsistent supervision, and limited use of data in decision-making. While digitization of community health information systems is recognized as a key enabler of Universal Health Coverage, adoption and sustained use continue to be limited by varied infrastructural and capacity challenges. Kenya has positioned e-CHIS as a central strategy for healthcare modernization. The Ministry of Health highlights that e-CHIS adoption represents a national commitment to utilizing digital technologies to enhance service delivery, especially in rural areas [13]. The Kenya Health Policy 2014–2030 aims to promote disease prevention, self-care, and health promotion through comprehensive e-CHIS implementation, eventually transitioning to a paperless national health system [14]. One of its fundamental goals is to integrate data across all healthcare levels through a unified national health information system. Globally, e-CHIS has contributed greatly to transforming health service delivery. Beyond Kenya, more than thirty African countries have adopted eHealth frameworks to harness digital innovations for addressing complex health challenges [15].

Despite its transformative capability, e-CHIS faces several limitations that impede efficient and effective implementation including inadequate training, data security risks, infrastructural barriers, limited technical support, and unreliable internet connectivity. Addressing these challenges is essential so as to maximize the benefits of e-CHIS and ensure sustainable deployment in community health service delivery. Despite the challenges, significant progress has been made in implementing e-CHIS across Awendo and Nyatike Sub-Counties in Migori County. Several pilot initiatives have successfully demonstrated the feasibility, effectiveness, and scalability of e-CHIS in community health service delivery. These achievements highlight the capability of e-CHIS to strengthen health systems, enhance data-driven decision-making, and expand access to quality healthcare across Migori County.

Novelty of the Work

This study contributes to new knowledge by offering a localized and well-grounded analysis of the factors influencing the adoption and sustained use of the Electronic Community Health Information System (e-CHIS) within Awendo and Nyatike sub-counties of Migori County, Kenya. While previous studies have examined similar predictors of e-CHIS adoption in broader contexts such as urban

health facilities or national-level implementations this research provides a distinct, community-based perspective from a rural, resource-limited setting.

The key contributions of this study are threefold:

1. **Identification of localized gaps:** By uncovering specific barriers including cultural influences, infrastructural constraints, and provider training deficiencies the study highlights the challenges often overlooked in national or urban-focused research.
2. **Practical insights and recommendations:** The findings offer actionable strategies suitable to rural Kenyan setup, providing healthcare providers, policymakers, and technology developers with evidence-based approaches to enhance e-CHIS uptake and sustainability which effectively bridges the gap between generalized research and site-specific implementation.
3. **Implications for scalability***:* The results contribute to policy development, expand the empirical evidence base, and inform the design of scalable e-CHIS deployment models suitable for other low-resource, rural areas across Kenya and sub-Saharan Africa.

Generally, this research promotes digital health scholarship by moving beyond generic technology adoption frameworks toward evidence-driven, regionally adaptive models. In doing so, it strengthens understanding of how localized implementation progress can improve health information management and enhance community health outcomes.

Schematic Diagram

A schematic diagram illustrating the study's conceptual framework, the TAM diagrams.

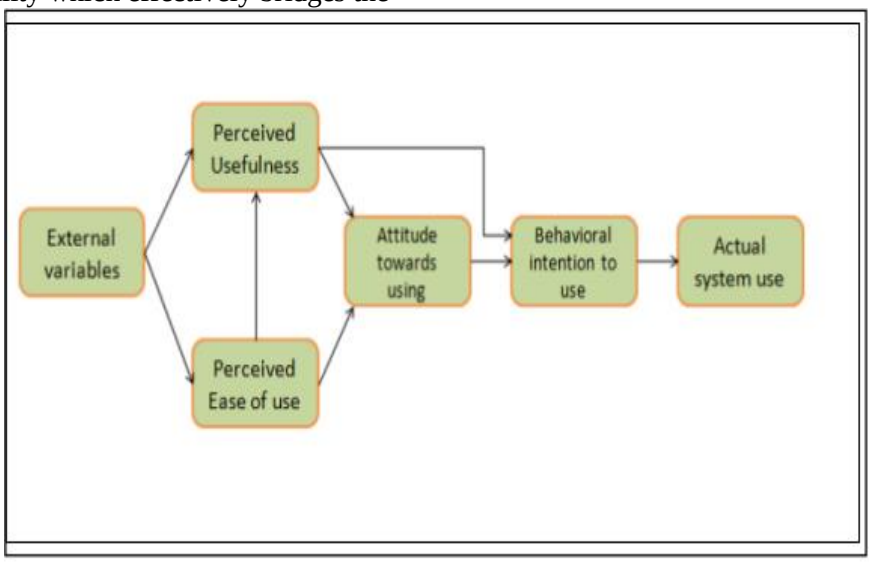

Figure 1. Technology Acceptance Model (Davis et., 1989; 2000)

Methodology

This research used a cross-sectional design and was carried out in the sub-counties of Nyatike and Awendo of Migori County, focusing on the adoption of Electronic Community Health Information System (e-CHIS) to deliver community health services. The two sub-counties were purposively chosen because they had both implemented the e-CHIS for more than two years while the other six sub-counties had implemented e-CHIS for less than two years that is Uriri, Rongo, Suna East, Kuria East, Suna West and Kuria West sub-counties were excluded from the study. Migori County is administratively divided into eight sub-counties: Suna West, Suna East, Nyatike, Awendo, Uriri, Rongo, Kuria East, and Kuria West. The study population consisted of health

care providers working in or administering community health services in Nyatike and Awendo sub-counties, this included Community Health Promoters (CHPs), Community Health Assistants (CHAs), Public Health Officers (PHOs), and Sub-County Health Management Teams (SCHMT) members who utilize e-CHIS in service delivery and supervision. A simple random sampling approach was used to select 303 CHPs, 29 CHAs, 25 PHOs. A structured questionnaire was administered to 357 health care providers. Additionally, 25 Focus Group Discussions (FGDs), each with 12 participants and In-depth interviews were carried out with 14 key informants (KII) from the sub-county health management teams. Informed consent was obtained from the participants.

Data Collection Procedure and Tools

The study utilized both quantitative and qualitative data collection methods.

Quantitative Data Collection

Quantitative Data was collected from 357 health care providers using structured questionnaires. The structured questionnaire was developed based on the Technology Acceptance Model (TAM) theoretical framework [16] assessing constructs such as *adoption and sustained use, perceived ease of use, perceived usefulness, intention to use,* and *facilitating conditions*. The items were rated on a 5-point Likert scale: *Strongly Disagree (1)* to *Strongly Agree (5)*. The TAM framework was specifically suitable for this study as it provides an extensive understanding of how healthcare providers perceive, accept, and use digital health technologies. It emphasizes the role of perceived usefulness and ease of use in determining user acceptance, adoption, and continued utilization. The *Facilitating Conditions* construct evaluated whether respondents had, resources, adequate infrastructure and knowledge to effectively utilize e-CHIS. Data were collected using an online survey tool *CommCare*.

Qualitative Data Collection

A long with the 357 structured questionnaire administered, additionally, 25 Focus Group Discussions (FGDs (Awendo 10 and Nyatike 15), each with 12 participants and In-depth interviews were carried out with 14 Key Informant Interviews (KIIs) (Awendo 7 and Nyatike 7) from the sub-county health management teams. The FGDs were conducted with CHPs to explore factors influencing adoption, sustained use, perceived ease of use, and intention to use e-CHIS. Discussion guides were structured, all sessions audio-recorded with participant consent, and notes taken to capture contextual details. The KIIs were held with sub-county health management team members using a semi-structured interview guide focusing on their perspectives regarding adoption, sustainability, and recommendations for strengthening e-CHIS implementation. All discussions were conducted privately to ensure confidentiality and promote open dialogue. The interviews were transcribed verbatim and analyzed thematically.

Data Analysis

Quantitative data were analyzed using both descriptive and inferential statistics. Descriptive analyses summarized demographic characteristics and key variables while correlation analyses examined relationships among predictor variables and adoption outcomes.

Logistic regression models were used to identify factors associated with the likelihood of adopting e-CHIS, while ordinal logistic regression models determined predictors of sustained use over time. Odds ratios (ORs) with corresponding confidence intervals were computed to assess the strength and direction of associations.

The independent variables included demographic characteristics, availability of

support, training exposure, perceived ease of use, and facilitating conditions. Statistical analysis was completed using SPSS software.

Qualitative data from FGDs and KIIs were analyzed thematically. Audio recordings were transcribed verbatim, coded, and grouped into emerging themes. The themes reflected facilitators and barriers to e-CHIS adoption and sustained use. Quantitative and qualitative findings were triangulated to provide validity and depth to the results.

Study Findings

Quantitative Findings

Summary of Responses from Questionnaire Pertaining adoption of e-CHIS.

The Demographics Characteristics of the Health Care Providers

Table 1. Descriptive Statistics by Adoption Status (Field data, 2025)

Characteristic	**Overall** N = 357	**Adopter** N = 338	**Non-Adopter** N = 19	**p-value**
Age (years)	42.01 (10.31)	41.98 (10.31)	42.68 (10.57)	**0.7**
Gender				**0.8**
Female	254 (71%)	241 (71%)	13 (68%)	
Male	103 (29%)	97 (29%)	6 (32%)	
Education Level				**0.4**
Bachelors_degree	24 (6.7%)	23 (6.8%)	1 (5.3%)	
Certificate	98 (27%)	95 (28%)	3 (16%)	
Diploma	65 (18%)	61 (18%)	4 (21%)	
Other	34 (9.5%)	34 (10%)	0 (0%)	
Primary	42 (12%)	38 (11%)	4 (21%)	
Secondary	94 (26%)	87 (26%)	7 (37%)	
Years of Experience	8.96 (6.80)	8.95 (6.89)	9.21 (4.92)	**0.5**
Sub-County				**0.037**
Awendo	144 (40%)	132 (39%)	12 (63%)	
Nyatike	213 (60%)	206 (61%)	7 (37%)	
Received e-CHIS Training	344 (96%)	327 (97%)	17 (89%)	**0.15**

Table 1 highlights the demographics and professional characteristics of the 357 healthcare providers grouped by e-CHIS adoption status. The overall sample (N = 357) had an average age of 42.01 years (SD = 10.31), which indicates a fairly mature and experienced workforce. Age differences between adopters (M = 41.98, SD = 10.31) and non-adopters (M = 42.68, SD = 10.57) were not statistically different (p = 0.7, Wilcoxon rank-sum test), suggesting that age has no substantial role in predicting e-CHIS adopters and non-adopters. The overall number of female providers (71%, n = 254) corresponds to international trends of more females staffing community addressing healthcare programs. The chi-square test (p = 0.8) indicated, there were no notable differences between male or female provider adoption status. Both the female (71%) and male (29%) providers had the same adoption status. Educational qualifications were variable across educational levels with participants having secondary education (26%, n = 94), certificates (27%, n = 98), or diploma level qualifications (18%, n = 65). The chi-square test (p = 0.4) did not find educational attainment

significant, although those participants who had education level "other" (n = 34) reported all had adopted e-CHIS, while the participants with primary qualifications showed slightly slower adoption rates (11% among adopter's vs 21% among non-adopters).

The average experience in the profession was (M=8.96 years, SD = 6.80), with no significant difference between the adopters (M = 8.95, SD = 6.89) and non-adopters (M = 9.21, SD = 4.92) (p = 0.5, Wilcoxon test). Under trainings, there was almost universal coverage (96%, n = 344), and although adopters (97%) were less than non-adopters (89%), the difference was not statistically significant (p = 0.15), indicating that access to training was not an obstacle to adoption.

The Professional Characteristics

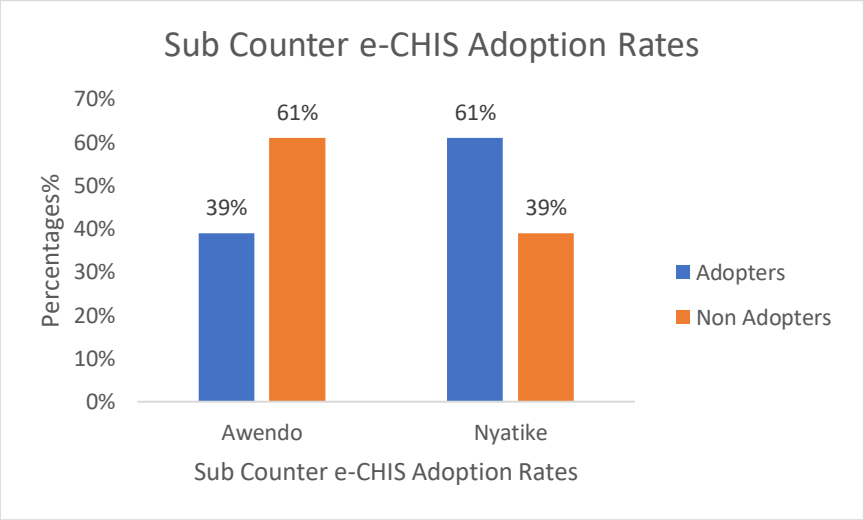

Figure 2. Sub County e-CHIS Adoption Rate (Field data,2025)

The figure 2 highlights a statistically significant difference by sub-county (p = 0.037), with Nyatike scoring a higher adoption rate (61% compared with Awendo at 39%), which may indicate differences due to infrastructure or other contextual factors.

Adoption Rate by Role in Community Health Services

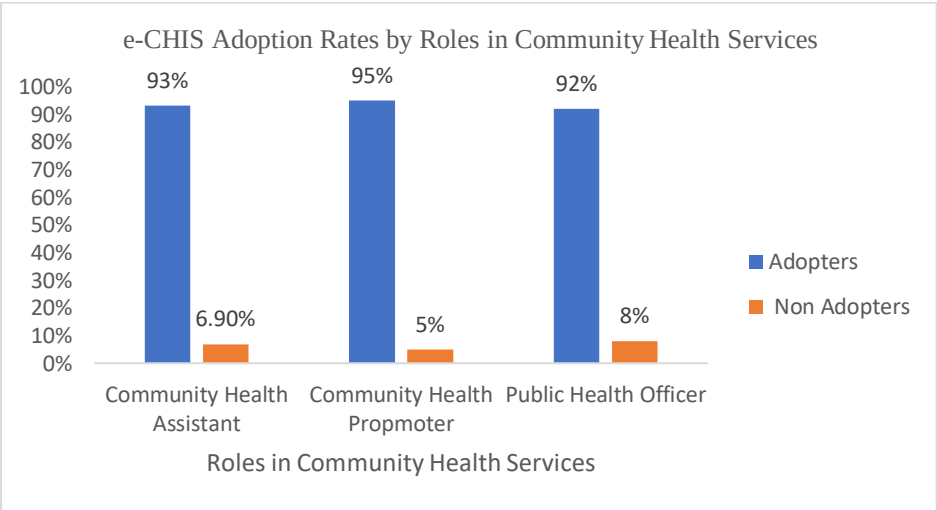

Figure 3. e-CHIS Adoption Rate by Role in Community Health Services (Field data, 2025)

Figure 3 above considers professional role, the most populated group were community health promoters (85%, n = 303), with the next most populated professional role being

community health assistants (8.1%, n = 29) and public health officer (7.0%, n = 25). Fisher's exact test (p = .05) indicated that professional role was not a significant predictor of e-CHIS adoption, despite the variation across application categories.

Psychometric Properties of Measurement Constructs

Table 2. Reliability Analysis of Construct Scales (Field data, 2025)

Construct	Cronbach.s.α	Number of Items	Interpretation
Perceived Ease of Use	0.923	3	Excellent
Perceived Usefulness	0.552	2	Poor
Social Influence	0.737	2	Acceptable
Facilitating Conditions	0.663	3	Poor
Intention to Use	0.929	4	Excellent

Table 2 includes the reliability analysis for the five theoretical constructs using Cronbach's alpha and provides a description of the psychometric properties of each construct. Perceived Ease of Use, with an alpha of 0.923, had excellent internal consistency surpassing the conventional cutoff of 0.70 for established scales, and approximating the standard of 0.90, which is suggested for high-stakes assessments of individuals. The reliability suggests that the three items measuring ease of use; system navigation, user-friendliness, and comfort with technology represent a strong unidimensional frame with minimal measurement error.

Perceived Usefulness, with an alpha of 0.552, did not have sufficient internal consistency and was not above the conventional cutoff of 0.70 indicating that the two items measuring perceived usefulness were likely not capturing the same underlying construct; or the two items include too much measurement error. Thus, the relationship of this variable was likely weaker than it would be suggesting that the real relationship is stronger than what was observed.

Social Influence had an acceptable reliability alpha of 0.737 with the standard for established scales. The two items; peer pressure and leadership support rely on shared representations of a coherent construct, but improvements could increase internal consistency.

Facilitating Conditions had an alpha of 0.663, indicating marginal reliability below the accepted cutoff; meaning that the three items; training access, technical support, and incentives, may not consistently embody a single latent trait, or there was variability in participants' responses based on their contextual positions.

Intention to Use exhibited a high level of internal consistency (α = 0.929), indicating that the items measuring frequent, routine, continued and future use intentions are a strong unidimensional scale supporting the use of Intentions as the key outcome variable for sustained-use analysis.

In general, the differences in reliability coefficients across constructs has meaningful interpretation. Relationships involving constructs with lower reliability, particularly Perceived Usefulness and Facilitating Conditions should be viewed with sensitivity to measurement error which may attenuate relationships.

Predictors of Initial e-CHIS Adoption

Table 3. Logistic Regression Predicting e-CHIS Adoption (Field data, 2025)

Term	Odds Ratio (Exp(B))	Std. Error	z-value	p-value	95% CI (Lower)	95% CI (Upper)	Significance
Intercept	0.000	4.296	-3.429	0.001	0.000	0.000	**
Perceived Ease of Use	2.269	0.605	1.354	0.176	0.727	8.320	
Perceived Usefulness	5.631	0.650	2.660	0.008	1.616	22.282	**
Social Influence	2.895	0.626	1.698	0.089	0.926	11.644	
Facilitating Conditions	3.363	0.922	1.316	0.188	0.539	23.667	
Age	1.029	0.053	0.543	0.587	0.934	1.156	
gender Male	0.433	1.008	-0.830	0.406	0.056	3.335	
Education: Secondary	0.229	1.187	-1.240	0.215	0.018	2.174	
Education: Tertiary	0.252	1.240	-1.110	0.267	0.019	3.000	
Years of Experience	0.985	0.091	-0.169	0.866	0.853	1.189	
Sub-County: Nyatike	13.880	1.123	2.341	0.019	2.015	195.322	*

Table 3 above highlights the results of a binary logistic regression analysis predicting e-CHIS adoption with the interpretations of the contribution of each of the predictors to the outcome model. Overall, the model performed well and several variables that provide theoretical relevance were statistically significant.

Perceived Usefulness was the most robust predictor (OR = 5.631, 95% CI [1.616, 22.282], p = 0.008). This suggests that for every one-unit increase on the 5-point usefulness measure the odds of healthcare providers adopting e-CHIS were 5.6 times greater after controlling for the contributes of the other variables.

Social Influence was found to be approaching significance (OR = 2.895, 95% CI [0.926, 11.644], p = 0.089). A conventionally high effect size suggests that increases in perceived social pressure or social support from leadership nearly tripled odds of adoption, indicating the potential synergies of peer and organizational influences.

Geographic location was identified as a highly significant predictor (OR = 13.880, 95% CI [2.015, 195.322], p = 0.019). Providers located in Nyatike sub-county had nearly fourteen times the odds of adoption compared to those located in Awendo. This adds to the evidence of a significant disparity in adoption based on geographic factors.

In contrast, Perceived Ease of Use did not differ significantly (OR = 2.269, 95 percent confidence interval [0.727, 8.320], p = 0.176) indicating that ease of use though conceptually relevant is not predictable of adoption independently of usefulness and location. Equally, Facilitating Conditions did not demonstrate a significant correlation (OR = 3.363, 95% CI [0.539, 23.667], p = 0.188), so the support structures (in this sample) including training and resources were not defining predictors.

Demographic and professional factors such as age (OR = 1.029, p = 0.587), gender (OR = 0.433 in males, p = 0.406), and education level (secondary: OR = 0.229, p = 0.215; tertiary: OR = 0.252, p = 0.267) and professional experience (OR = 0.985, p = 0.866) did not have significant relations with adoption since the confidence

Lastly, the intercept value (OR =0.000, p=0.001) shows that the odds of adoption at the baseline are incredibly low in the case of all predictors being equal to zero.

Comprehensive Analysis of Sustained Use Intention

Table 4. Predicting Sustained e-CHIS Use Intention (Field data, 2025)

Term	Estimate	Std. Error	t-value	p-value	95% CI (Lower)	95% CI (Upper)
Intercept	0.765	0.158	4.843	0.000	0.454	1.076
Perceived Ease of Use	0.541	0.042	13.026	0.000	0.459	0.623
Perceived Usefulness	0.172	0.037	4.602	0.000	0.099	0.246
Social Influence	0.167	0.034	4.911	0.000	0.100	0.234
Facilitating Conditions	-0.040	0.041	-0.984	0.326	-0.120	0.040
Age	-0.001	0.002	-0.362	0.717	-0.005	0.003
Gender: Male	-0.070	0.043	-1.615	0.107	-0.154	0.015
Education: Secondary	0.016	0.044	0.358	0.721	-0.071	0.103
Years of Experience	-0.001	0.003	-0.335	0.738	-0.007	0.005
Sub-County: Nyatike	0.062	0.041	1.537	0.125	-0.017	0.142

Table 4 illustrates the results of the linear regression analysis examining sustained use intention of e-CHIS, with a full explanation of the coefficients, the model diagnostics, and the reading of significance levels. The linear regression model demonstrated exceptional fit, explaining 71.9% of the variance in sustained use intention ($R^2 = 0.719$, Adjusted $R^2 = 0.712$). The F-statistic was highly significant ($F [9, 347] = 98.689$, $p < 0.001$), indicating the overall model had better fit than a null model without predictors.

Perceived Ease of Use was the most important predictor ($B = 0.541$, $SE = 0.042$, $t = 13.026$, $p < 0.001$), across the 5-point intention scale every unit increase of perceived ease of use is associated with a 0.541-point increase in intention. The 95% confidence interval (CI) was narrow (95% CI [0.459, 0.623]) and demonstrates the precision of this strong effect and the importance of usability for sustaining use.

Slightly weaker but still significant was *Perceived Usefulness* ($B = 0.172$, $SE = 0.037$, $t = 4.602$, $p < 0.001$), as every one-unit increase in perceived usefulness was related to a 0.172-point increase in intention. This was due to the reliability of the construct being lower, but still exhibited the importance of perceived usefulness for sustained use. A similar effect size was found for *Social Influence* ($B = 0.167$, $SE = 0.034$, $t = 4.911$, $p < 0.001$), thus peer encouragement or leadership support firms a determinant of continued use, as demonstrated with the tighter 95% CI [0.100, 0.234].

Facilitating Conditions exhibited a non-significant negative relationship ($B = -0.040$, $SE = 0.041$, $t = -0.984$, $p = 0.326$), with its confidence interval (95% CI [-0.120, 0.040]) crossing zero, suggesting that formal support systems may not directly affect sustained use,

possibly due to adequate baseline infrastructure or compensatory mechanisms among users.

All demographic and professional variables were non-significant: age (B = -0.001, p = 0.717), gender (B = -0.070 for males, p = 0.107), education (B = 0.016 for secondary level, p = 0.721), years of experience (B = -0.001, p = 0.738), and sub-county (B = 0.062 for Nyatike, p = 0.125), implying that psychological and perceptual dimensions are more influential determinants of sustained use than demographic attributes.

Qualitative Findings

Summary of Responses from the 25-focus group discussions and 14 in depth key interments concerning e-CHIS adoption over time.

Thematic analysis from Focus Group Discussions

Findings from the content and thematic analysis revealed that sustained adoption of e-CHIS depends heavily on system reliability and operational independence from external resources. Participants emphasized that the system should synchronize automatically and operate efficiently without requiring users to purchase internet data bundles. Sustained use also requires seamless integration with other health information systems, especially the Kenya Health Information System (KHIS), so as to ensure that referrals are received, acknowledged, and tracked effectively.

Integration with complementary digital tools such as *CommCare* and *Afya Yangu* was also viewed as valuable, for identifying clients and verifying health insurance status. Community Health Promoters (CHPs) expressed optimism about the future of e-CHIS, recognizing its potential to enhance timely and efficient service delivery. Participants also emphasized the need to stabilize the system and fix persistent errors such as delayed synchronization, freezing, and data loss to prevent disruptions that could hinder continued use.

Thematic Analysis Key Informant Interviews

Thematic analysis of the Key Informant Interviews (KIIs) highlighted critical factors influencing e-CHIS adoption and long-term sustainability. While respondents viewed e-CHIS as a timely and necessary transition toward digital health, concerns were raised about the system's future sustainability, primarily due to uncertainty over system ownership which provokes suspicion about potential system discontinuation or data insecurity.

System reliability emerged as a strong predictor of sustained use. Informants consistently identified the need to improve system functionality by resolving persistent issues such as data synchronization errors. They further recommended the integration of e-CHIS with secondary tools, such as the MOH 515 tool, and the incorporation of key Ministry of Health forms, particularly the MOH 100 so as to streamline referral workflows and simplify the work of CHPs.

> *"The biggest the major challenge so far is data synchronization. if they can the IT team can work on it, then there will be an improvement."_AUD AWENDO PHO WARD 5*
>
> *"we need to integrate the system. And the system should be we should find a way of having MOH 515 linked to this e-CHIS directly."_AUD AWENDO SCHRIO 1*

Improving integration and compatibility was identified as essential for sustained use. Respondents advocated for direct linkage between e-CHIS and KHIS, enabling real-time data sharing across systems. Additionally, sub-county health managers and facility-based supervisors were reported to require super-user access or login privileges to view community performance data, a functionality that is currently unavailable.

Discussion

Alignment with Global e-Health Adoption Literature

The high rate of e-CHIS adoption (94.7%) found in this research study stands in contrast to the global patterns found in the literature. Although the [17] states that more than one hundred countries have developed and implemented national eHealth policies, actual adoption and implementation rates are still variable. Our findings are higher than reported 17% EHR adoption rate in U.S. for residential care communities as reported by Caffrey and Park-Lee [18], and the reported 26% EHR-capable Community Health Centers funded by the federal government. This difference indicates that the centralized and government-led e-CHIS roll-out in Kenya may counteract the funding limitation that [19] identified as a key barrier to adoption in a high-income context.

Perceived Usefulness reasons for initial EHR adoption were also statistically significant (OR = 5.631, p = 0.008), which is consistent with the original Technology Acceptance Model created by [20], but the significance is higher than in many developed contexts. This higher significance may indicate that the perceived benefits of digital systems in low resource settings is closer and more tangible, compared to high resource settings where paper-based systems present great logistical obstructive burden. Digital health systems can change the way community health services operate by providing timely and accurate data, thus enabling health care workers to make informed decisions [21].

Contextual Variations in Technology Acceptance Factors

The shift from *Perceived Usefulness* driving initial adoption to *Perceived Ease of Use* predicting sustained use represents a novel extension of existing theory [22] proposed that performance expectancy [usefulness] and effort expectancy [ease of use] are significant predictors of intention to use but did not explore their temporal evolution. Our findings reveal a changing flow in which initial adoption decisions emphasize utility, while long-term engagement increasingly depends on usability.

This pattern is in contrast with [23] South African study, where both constructs simultaneously predicted adoption without temporal differentiation which may reflect the longer implementation period in our study (over two years) or cultural variations in technology use between Kenya and South Africa.

Geographical Disparities in Implementation Success

The significant geographical difference between Nyatike and Awendo sub-counties (OR = 13.880, p = 0.019) supports [23] emphasis on basic issues such as poor electricity and network connectivity, while [24] illustrated rural-urban inequalities regarding barriers in healthcare access, our findings show that barriers within a single county and even within sub-counties may significantly influence the adoption outcomes.

This finding contradicts [25] who described a positive angle on telemedicine, stating it has quality and affordable health care to underserved populations no matter the infrastructure barriers. Given our findings, digital health innovations and telemedicine may perpetuate, rather than reduce, existing inequities unless the underlying infrastructure disparities are accounted for and resolved.

Social Influence and Cultural Context

The marginal significance of Social Influence for initial adoption (p = 0.089) and its strong impact on sustained use (p < 0.001) supply nuanced evidence regarding the UTAUT framework; however, they challenge its universality. Venkatesh et al. (2003) displayed the explanation fits in context of mandatory use; however, the current example

demonstrates a more nuanced context within community health.

This finding suggests an extension of [26] work in Kisii County, Kenya, who had identified trust and confidence in CHWs to be primarily bounded to referral services. In the case of Social Influence, it suggests the form of social influence changes as relationships deepen. Over time, it appears that the group decision-making approach and peer reinforcement systems make sustained use more possible, these dynamics reflect a socially-oriented form of culture across Kenyan society.

Reliability and Measurement Challenges in Context

The variations in the reliability coefficient across constructs reflect similar challenges in another research. The low reliability of Perceived Usefulness ($\alpha = 0.552$) and Facilitating Conditions ($\alpha = 0.663$) mirrors how [27] found that, in Ethiopia, only 38.4% of participants were regular users of facility health information, which may highlight differences in how local context shapes the interpretation of the construct. The counterfactual is also worth noting, as [28] found high reliabilities in constructs in developed settings and support [29] in identifying practical uses of e-health and m-health faced multiple barriers because of poor ICT infrastructure and staff training and low literacy levels, all of which could shape how participants conceptualized and responded to the survey items.

Demographic Factors and Equity Considerations

The repeated non-significance of demographic and professional characteristics challenges traditional views of digital divides. While [30] noted limited computer skills of primary users as a significant barrier in sub-Saharan Africa, our findings indicate that, with sufficient training (96 percent in our sample), that barrier can be overcome. This aligns with [31] focus on co-design in the effective design and implementation of the e-CHIS in Kenya, where inclusive design and preparation of users can lessen the impact of individual differences. However, it is in partial conflict with [32] assertion that health system factors impacting the use of EMR among health providers were impacted by professional characteristics in Siaya County.

Theoretical Integration and Contextual Adaptation

The sustained use model exhibits considerable explanatory power ($R^2 = 0.719$), higher than most previous studies using patterns of acceptance TAM-based studies, and indicates greater potential theoretical utility when the use of digital tools is seen as a substantial shift in paradigm. These supports [2] finding that - in Ethiopia - they report e-CHIS receives good acceptance from health extension workers but they have limited actual use, although we observe high acceptance and strong use intention in our study.

Our findings also build on [10] conceptualization of technology adoption as a dynamic process. The changing predictive importance of constructs across the stages of adoption underscores the need for a dynamic, temporal model of technology acceptance.

Implementation Strategy and Sustainability

The exceptionally high adoption and strong sustained use intentions support the Kenya National Community Health Information Systems Strategy 2020–2025, which emphasizes that generating data required for program monitoring, planning, and assessment as well as the effectiveness of the health care delivery system. The Migori County experience validates this strategy's effectiveness but also highlights uneven implementation quality. This supports [11] emphasis on total stakeholder participation for health systems as essential for sustainable digital transitions.

Methodological Consistency and Divergence

The psychometric inconsistencies we documented resemble those noted in previous studies. Reference [33] reported positive health sector transformation in Kenya through integrated health management information systems, but did not deal with reliability problems. Our reporting provides methodological transparency for future health information systems research.

The focus on Migori County provides a good contextual specificity, but limits comparability to national analyses like [34] Universal Health Coverage in Kenya with a larger analysis that speaks to generalizability within a spectrum of trade-offs in HIS research between contextual specificity and generalizability.

Recommendations

The Ministry of Health should develop a national framework, uniformly applied but still flexible, to increase and sustain the uptake of e-CHIS that integrates the key factors of success from this study (e.g. leadership involvement, training, and implementation). This framework must start with an emphasis on making targeted investments in the infrastructure, with a nod to the disparity evident between sub-counties, particularly where connectivity is sub-standard and where resources are low. Demonstrating ongoing capacity development and providing technical help and feedback (to leaders) will strengthen ongoing reliability and user confidence in the system in future.

Additionally, the implementing teams must consider learning in a phased approach that reflects the fluidity expected in technology acceptance. The early phase should emphasis demonstrating the usefulness and value of the system, while later phases should have focus on usability, efficiency, and experiences. Flexibility in local adaptation is essential, and each sub-county should create a phased plan deliberate of the unique infrastructure, leadership, and community compositions.

Peer mentoring networks and learning opportunities could utilize social influence in service of user engagement, motivation, and accountability.

In addition, training practices should vary based on stages of adoption as well, and should begin with digital literacy, using the system, and skills for data-use, then advance to topics that allow for continuous professional development such as refresher courses and certification as the system and the context evolves.

Similarly, future research should use longitudinal and mixed-methods perspectives to explore regional differences, examine the causal relationship between e-CHIS and service delivery as well as health outcomes, and examine factors that promote scalability and sustainability. The combination of technology acceptance theories, an implementation science framework, and a community perspective will formulate a complete understanding of digital health adoption and its broader role for equitable health improvement.

Conclusion

This study provides strong support for the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) in the implementation of electronic Community Health Information Systems in Migori, rural Kenya. The significant explanatory power of the sustained use model ($R^2 = 0.719$) shows that these frameworks are still valid and relevant, even in health systems with limited resources. However, the change in key factors from *Perceived Usefulness* affecting initial adoption (OR = 5.631, p = 0.008) to *Perceived Ease of Use* predicting sustained use intention (B = 0.541, $p < 0.001$) indicates that technology adoption is a developing process, and not a one-time event.

The differential reliability of constructs, specifically the lower internal consistency for *Perceived Usefulness* ($\alpha = 0.552$), implies that theoretical constructs require contextual and

cultural adaptation to maintain validity. Moreover, the ongoing non-significance of demographic characteristics contests assumptions about the digital divide, as supportive implementation and inclusive training can counteract inequalities in digital literacy.

Practically, the high adoption rate (94.7%) within the sample and mean intention to continue to use (4.2/5.0) indicates digital health systems can sustain in a low resource context when fostered by leadership engagement, substantial training, and organized technical assistance. However, the geographic differences between sub-counties demonstrate that successful implementation is significantly contingent on local context; such as, existing infrastructure, management buy-in, and the social ecology. The developing experience of peer encouragement and leadership support indicate the need for ongoing interpersonal and organizational support to continue to sustain the system.

Concluding Synthesis

This research emphasizes the significant implications and complexities associated with the implementation of digital health in resource-limited environments. The high adoption rate of e-CHIS in Migori County is clear empirical evidence that, when resourced properly, digital health can be integrated across health systems. However, the significant geographical variation and fluid determinants of adoption point to the need for contextually-based, adaptive implementation strategies from the outset.

This study adds to theoretical and practical knowledge in the digital health field. It contributes to technology acceptance models by documenting important contextual variations, while simultaneously providing applicable recommendations for policymakers, implementers and researchers. Ultimately, these findings illustrate the fact that successful digital transformation requires technological innovation, as well as social, infrastructural and organizational alignment.

As countries like Kenya and other low- and middle-income countries move towards Universal Health Coverage (UHC), digital tools like e-CHIS will be increasingly important for expanding access to UHC, improving quality of service, and enabling data-driven decision-making. This study lays the groundwork to maximize the impact of these tools; it provides a roadmap for sustainable scale-up, and also reminds us that, inclusive of local buy-in, the challenges of implementation and digitization must be taken into consideration if digital health innovations are to enhance population health outcomes.

Ethical Considerations

The study protocol was reviewed and approved by the National Commission for Science, Technology and Innovation of Kenya (NASCOSTI/P/25/4175747), Ethical approval was obtained from the Maseno University Ethics Review Committee (Reference: [MSU/DRPI/MUERC/01550/25]) and permission was sought and granted by the County Government of Migori, as well as Nyatike and Awendo Sub Counties managers. Participants provided informed consent, with measures ensuring confidentiality, anonymity, and voluntary participation per the Declaration of Helsinki.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

- **Ms. Jacinter Atieno Odira:** Conceptualized study, conducted literature review, designed study methodology, collected data, analysed results and developed the manuscript.
- **Mr. Collins Ouma:** participated in analysed results, reviewed and revised manuscript. Offered expertise on research

protocols, contributed to discussion on adoption factors. All authors approved the final manuscript.

Funding

This research study was self funded by the authors with no sponsorship or external grants.

Conflict of Interest

I hereby declare that I have no conflict of interest regarding the publication of the article titled: “Identify the factors that predict the adoption and sustained use of the Electronic Community Health Information System over time in Nyatike and Awendo Sub counties, Migori County, Kenya using TAM Framework”.

Acknowledgements

I would like to express my deepest gratitude to the participants in this research. Their invaluable guidance, insightful feedback, and cooperation have been instrumental in the completion of this journal article. I am particularly grateful to my research guide, Prof. Collins Ouma the student mentor for his expert advice, patience, and unwavering support throughout this study, his profound knowledge and dedication have greatly enriched my research experience. I also extend my heartfelt thanks to the entire faculty of the Texila American University Public Health Programme for fostering a conducive environment for research and learning. Their collective efforts have significantly contributed to the successful completion of this work. Finally, I would like to thank my family for their endless encouragement, understanding, and support, which have been the foundation of my perseverance during this research journey.

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