A FRAMEWORK FOR INTEGRATING TRADITIONAL MEDICINE INTO UGANDA'S NATIONAL HEALTH CARE SYSTEM

CASE STUDY: THE UGANDAN: EMR SYSTEM

A dissertation presented to

FACULTY OF SCIENCE

in partial fulfillment of the requirements for the award of the degree

Master of Science in Information Systems

UGANDA MARTYRS UNIVERSITY

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2022-M132-2437

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August 2025

UGANDA MARTYR'S UNIVERSITY

SCHOOL OF POSTGRADUATE STUDIES AND RESEARCH

Master's Dissertation

DECLARATION

I have read the rules of Uganda Martyrs University on Plagiarism and hereby state that this work is my own.

It has not been submitted to any other institution for another degree or qualification, either in full or in part

Throughout the work, I have acknowledged all sources used in its compilation.

Name of Researcher: **LAMECK KIYIMBA**

Researcher's Signature: _____ ____

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APPROVAL

This is to certify that this research was conducted under my supervision and submitted for examination with my endorsement as partial fulfillment for the award of a Master's degree in Information Systems at the Uganda Management Institute:

Name of Supervisor: Mr. Muganji Julius

Signature of Supervisor: …….

Date: 09/01/2025

- Submitted to: The School of Postgraduate Studies and Research

DEDICATION

This work is dedicated to all my family members for the support they rendered to me over the years. May God Bless You All.

ACKNOWLEDGEMENTS

I am grateful to many people for their assistance and goodwill while I was completing this program. First and foremost, I want to express my heartfelt gratitude to the Almighty God for the grace that has sustained me.

I would like to express my sincere gratitude to my university supervisor Dr. Julius Muganji for his meticulous and thorough supervision, guidance and motivation which helped in bringing this thesis to a successful completion. Dr. Julius Muganji is a very optimistic person, and he taught me to be satisfied with nothing less than perfection.

I want to express my gratitude for the immeasurable support I received from my family and friends for the financial, moral and material support rendered to me during this period.

Lastly, I would like to thank all the respective district authorities, health facility staff and traditional healers for the support rendered to me during this field work period and to all rural household head respondents who consented to respond to the survey amidst their busy schedules.

ABSTRACT

Traditional Medicine (TM) remains a critical component of healthcare in Uganda, with over 60% of the population, particularly in rural areas, relying on TM as a primary source of care. Despite this, TM data has largely been excluded from national health information systems, including UgandaEMR—the most widely used electronic medical records (EMR) platform covering approximately 1,900 health facilities across the country. This exclusion has resulted in incomplete health data, limited integration of culturally relevant care practices, and challenges in regulating traditional health services.

The study identified multiple barriers that hinder the integration of TM data into UgandaEMR. These include gaps in policy and governance, lack of standardized data collection tools, infrastructure constraints, limited technical capacity, and socio-cultural resistance among practitioners and communities.

To overcome these challenges, a practical framework for integrating TM data into HMIS was developed. The framework consists of four layers: strategic governance and planning, system assessment and development, deployment and operationalization, and change management. It emphasizes modular system design, standardization of TM data elements, interoperability with UgandaEMR, and targeted capacity-building for health facility staff and TM practitioners. These design elements ensure that the integration is scalable, contextually relevant, and technically feasible.

Validation of the framework was conducted with 62 stakeholders including TM practitioners, health facility staff, EMR administrators, and policymakers confirmed the framework's relevance and practicality. Stakeholders highlighted the adaptability of UgandaEMR, cost-effective integration strategies using mobile and open-source platforms, willingness to adopt reporting tools, and moderate institutional support as key enablers. Participatory governance and culturally sensitive approaches were deemed essential to foster trust, enhance adoption, and ensure accurate documentation of TM practices.

Overall, the study demonstrates that integrating TM data into UgandaEMR, supported by a structured framework and stakeholder engagement, can improve data completeness, strengthen evidence-based policy formulation, and promote equitable healthcare delivery.

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LIST OF ABBREVIATION AND ACRONYMS

AYUSH	Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy
CAGR	Compound Annual Growth Rate
DHIS2	District Health Information Software, version 2
DHO	District Health Office/Officer
EMR	Electronic Medical Record
HMIS	Health Management Information System
HSSP	Health Sector Strategic Plan
IT	Information Technology
KII	Key Informant Interview
LMIC	Low- and Middle-Income Countries
MOH	Ministry of Health
NCRI	National Council for Research and Innovation
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa
TCM	Traditional Chinese Medicine
TM	Traditional Medicine
UHC	Universal Health Coverage
URC	Uganda Resource Centre for Digital Health
WHO	World Health Organization
UgandaEMR	Uganda Electronic Medical Record system

CHAPTER ONE
Introduction

1.0 Introduction

The integration of digital technologies into healthcare systems has transformed the way health information is collected, managed, and utilized. In Uganda, this transformation is evident through the adoption of platforms such as the District Health Information Software (DHIS2) and the Uganda Electronic Medical Records system (UgandaEMR)**,** both of which support data-driven decision-making in healthcare facilities (Dahabieh et al., 2018). These systems predominantly focus on biomedical and disease-specific interventions such as HIV/AIDS, maternal health, tuberculosis, and child immunization. However, despite their wide use, these platforms exclude a critical component of the national health ecosystem — Traditional Medicine (TM)**.**

1.1 Background to the Study

Traditional medicine continues to play a pivotal role in Uganda's healthcare delivery, especially in rural and underserved communities. According to the Ministry of Health (2019)**,** over 60% of the population relies on traditional medicine for primary healthcare. Similarly, the World Health Organization (2023) notes that nearly 80% of the population in Sub-Saharan Africa depends on TM for basic health needs. This reliance is shaped by socio-cultural beliefs, affordability, accessibility, and perceived effectiveness of herbal and spiritual treatments. Yet, traditional healthcare practices remain largely undocumented within Uganda's formal digital health infrastructure, leading to significant gaps in health data and policy planning (UBOS, 2022).

Despite formal recognition of TM through the Traditional and Complementary Medicines Act (2019), most traditional healers in Uganda operate outside the regulatory framework of the Ministry of Health. Their services are not included in national data reporting channels such as UgandaEMR or DHIS2. As a result, critical health encounters go unreported, creating blind spots in public health surveillance, research, and resource allocation (Fennelly et al., 2020). The lack of visibility for TM in digital systems undermines the government's efforts to provide inclusive, comprehensive, and evidence-based healthcare services.

Uganda's health infrastructure comprises more than 6,500 health facilities spread across 146 districts, ranging from national referral hospitals to community-level health centers (DHI, 2017). These facilities generate vast volumes of patient data, primarily focusing on conventional biomedical interventions. However, a significant proportion of patients also seek TM services either concurrently or prior to visiting formal health facilities (Parks, 2019). This dual care-seeking behavior complicates patient management, especially when healthcare providers are unaware of previous TM interventions, which may result in harmful drug interactions or redundant treatments.

Digital health platforms in Uganda are heavily program-specific and donor-driven. Systems like Clinic Master**,** PMIS**,** eAFYA**,** KP Tracker, and TB-eCBSS cater to vertical programs such as HIV, reproductive health, and tuberculosis (Dehnavieh et al., 2018). While these systems contribute to disease-specific progress, they operate in silos and fail to capture holistic patient histories, particularly those involving traditional care. The exclusion of TM from such platforms poses challenges to interoperability, continuity of care, and clinical decision-making (Kotzé, 2013).

Traditional medicine practices in Uganda are further complicated by the absence of standard documentation protocols. Traditional healers often rely on oral transmission of knowledge and do not maintain structured patient records (Fennelly et al., 2020). This lack of formalization prevents effective data capture, hinders research into TM efficacy and safety, and limits the integration of TM into broader health systems. Moreover, many TM practitioners face barriers such as low digital literacy, inadequate training in data management, and skepticism toward government regulation (Parks, 2019).

Globally, several countries have made strides in integrating TM into national health systems. China has incorporated Traditional Chinese Medicine (TCM) into electronic hospital records and health insurance frameworks, offering a model for harmonizing traditional and modern care (WHO, 2024). India, through the Ministry of AYUSH, has developed digital systems under the National AYUSH Mission to regulate and document Ayurveda, Unani, and other traditional practices. African countries such as Ghana and South Africa have initiated co-referral systems and regulatory frameworks that enable collaboration between traditional and biomedical practitioners (WHO, 2024). These models demonstrate the feasibility and benefits of integrating TM into formal health information ecosystems.

In contrast, Uganda lacks a comprehensive national strategy to digitally document and monitor TM practices. Multiple studies have highlighted the urgent need for integrating diverse sources of health data to strengthen disease surveillance, improve planning, and ensure inclusive health coverage (Smith et al., 2021; Kaplan, 2021). Barriers such as the absence of standardized coding systems for TM diagnoses, weak enforcement of policies, limited stakeholder engagement, and infrastructural limitations continue to obstruct progress (Bryson, 2018; Kerzner, 2019).

The fragmentation of Uganda's health data landscape poses critical risks. Without shared records, healthcare providers are often unable to access comprehensive patient histories, leading to misdiagnosis, treatment duplication, and reduced treatment efficacy (Nguyen et al., 2019). Furthermore, the exclusion of TM hinders the Ministry of Health's capacity to monitor and evaluate the safety, effectiveness, and utilization of traditional practices. This not only affects individual health outcomes but also compromises national health planning and public health policy.

Given the widespread use of TM and the increasing adoption of digital health tools in Uganda, there is an urgent need for a contextually appropriate and standardized framework for integrating TM data into UgandaEMR. Such a framework must address technical, legal, and cultural barriers while aligning with national health goals and digital infrastructure. It should promote stakeholder collaboration, define governance and interoperability standards, and support the safe and ethical use of TM data for health system strengthening. Without this integration, Uganda will continue to operate with an incomplete understanding of its population's health-seeking behaviors and healthcare needs (Smith, 2021; WHO, 2023).

1.2 Problem statement

. Uganda's health sector has made notable gains in digital health through platforms such as DHIS2 and UgandaEMR, which have strengthened data-driven decision-making in key disease programs including HIV/AIDS, tuberculosis, maternal health, and immunization (Dehnavieh et al., 2018). However, Traditional Medicine (TM)—the first point of care for over 60% of Ugandans, especially in rural and underserved areas (MoH, 2019; WHO, 2023)—remains systematically excluded from these systems. This omission creates a major blind spot in the national health information ecosystem, undermining the ability to capture a complete picture of the country's health needs.

The primary barriers to integration lie in (1) the absence of standardized data collection and coding systems for TM practices, (2) the lack of interoperability between TM records and existing EMR platforms, and (3) limited digital literacy and infrastructure among TM practitioners. These challenges lead to incomplete patient histories, fragmented care pathways, and missed opportunities for clinical safety—such as preventing contraindicated treatments for patients who alternate between TM and biomedical care (Nguyen et al., 2019). Without accurate, shared health records, Uganda's health system risks misinformed decision-making and suboptimal patient outcomes.

The sociocultural dimensions of this exclusion are equally critical. Many TM practitioners are hesitant to share data due to fears of overregulation, loss of intellectual property, or erosion of cultural heritage (Parks, 2019). Any integration effort must therefore be culturally sensitive, ensure community trust, and uphold the rights of knowledge holders, or it risks alienating the very stakeholders it seeks to involve.

Internationally, countries such as China, India, Ghana, and South Africa have implemented models that successfully integrate TM data into national EMR systems, improving surveillance, patient safety, and health planning (WHO, 2024). Uganda's current approach—where donor-funded, disease-specific systems operate in silos without shared standards—falls short of this benchmark (Kotzé, 2013; Bryson, 2018).

This study addresses the urgent need for a nationally endorsed integration framework that can bridge TM and biomedical health information systems. By focusing on data standardization, interoperability protocols, and culturally respectful implementation strategies, the proposed framework aims to improve the completeness, accuracy, and inclusivity of Uganda's health data. In doing so, it will strengthen evidence-based planning, enhance care coordination, and align Uganda's health system with global best practices and the goals of Universal Health Coverage.

1.3 General research objective

To develop a framework for integrating traditional medicine data into Uganda's Health Management Information Systems (HMIS), aimed at improving the quality, accessibility, and use of health information to support evidence-based decision-making within the national healthcare system.

1.4 Specific research objectives

1. Identify and analyze the key barriers and challenges to integrating Traditional Medicine (TM) data into Uganda's Health Management Information System (HMIS), with a focus on technical, socio-cultural, policy, and infrastructure constraints.

2. Design a practical integration framework for TM data within HMIS, considering stakeholder perceptions, system requirements, and opportunities for capacity building

3. Validate the proposed integration framework through stakeholder engagement, focusing on system adaptability, cost-effectiveness, institutional and political support, and inclusion of TM practitioners in policy development.

1.5 Research Questions

1. What are the key barriers and challenges—technical, socio-cultural, policy-related, and infrastructural—to integrating Traditional Medicine (TM) data into Uganda's Health Management Information System (HMIS)?
2. What framework can be developed to integrate TM data into HMIS in a way that addresses the identified barriers and strengthens stakeholder capacity and participation?
3. How feasible is the proposed integration framework, considering system adaptability, cost-effectiveness, institutional and political support, and the inclusion of TM practitioners in policy development?

1.6 Significance of the study

This research aims to develop a framework for integrating traditional medicine data into the existing Uganda Electronic Medical Records system, addressing the current exclusion and fragmentation of traditional health information within the national health system.

The framework will establish standards and protocols that enable seamless integration and interoperability between traditional medicine practices and biomedical health information systems, ensuring scalability and inclusiveness across all healthcare programs in Uganda.

The study will enhance understanding of the unique data requirements, cultural considerations, and implementation challenges involved in digitizing traditional medicine within a formal EMR system.

The findings and framework will provide practical guidance for the Ministry of Health, health facilities, and traditional medicine practitioners in adopting an integrated EMR platform, thereby improving holistic healthcare delivery, data accuracy, and policy formulation.

At a global level, the study addresses a critical gap in health information management by providing a model for integrating traditional medicine into national health systems—an approach that aligns with the World Health Organization's strategy to promote universal access to safe, effective, and culturally appropriate traditional, complementary, and integrative medicine. By creating a scalable and adaptable framework, the research offers a reference model for other countries, particularly those where traditional medicine forms the backbone of primary healthcare.

This integration fosters inclusive and culturally respectful healthcare, enhances evidence-based policy formulation, and optimizes resource allocation. It also contributes to global efforts toward Universal Health Coverage by ensuring that both biomedical and traditional practices are documented, standardized, and accessible within health information systems. Moreover, it supports research, regulation, and safe use of traditional medicine worldwide, preserving indigenous knowledge while advancing digital health innovation.

1.7 Justification of the Study

This study is timely and critical for several reasons:

- Policy relevance: While the Traditional and Complementary Medicines Act (2019) recognizes traditional healers, it does not provide clear digital documentation guidelines. This study bridges that gap by proposing a digital framework.
- Health equity: Rural communities relying on TM are underrepresented in national data. This research promotes inclusiveness and equity in healthcare reporting and planning.
- Innovation: Integrating TM with digital systems remains an unexplored area in Uganda. Your work will pioneer a localized, culturally sensitive framework in the region.
- Global alignment: The research aligns with WHO's Traditional Medicine Strategy 2023–2032, which encourages member states to integrate traditional practices into national health systems.
- Data-driven policy: Uganda's policy decisions lack complete data on traditional medicine use. This study will support more accurate and inclusive health resource allocation.

1.8 Scope of the Study

This study is designed to provide a comprehensive investigation into the integration of Traditional Medicine (TM) into Uganda's digital health ecosystem, particularly focusing on the Uganda Electronic Medical Records (UgandaEMR) system. The scope of this study is defined as follows:

1.6.1 Content Scope

This study focuses on the integration of Traditional Medicine (TM) data into Uganda's Health Management Information System (HMIS), with specific emphasis on UgandaEMR as the primary electronic platform. The scope covers:

- Identifying and analysing barriers and challenges including technical, socio-cultural, policy, and infrastructural constraints that hinder the integration of TM data into Uganda's HMIS.

- Assessing stakeholder readiness and perceptions regarding TM data integration, focusing on awareness of HMIS tools, willingness to adopt reporting systems, and access to training and capacity-building opportunities.
- Validating a proposed integration framework through stakeholder engagement, examining aspects such as system adaptability, cost-effectiveness, institutional and political support, and the inclusion of TM practitioners in policy development.
- Drawing lessons from international best practices (e.g., India, China, Ghana, and South Africa) to inform a context-specific integration framework tailored to Uganda's healthcare and cultural landscape.

1.6.2 Geographical Scope

The study is limited to selected health facilities, both public and private, that are already using UgandaEMR or other related health information systems under the Ministry of Health (MoH). Special focus will be given to:

- Urban and rural health centres in selected districts that rely heavily on TM.
- Interviews and consultations with TM practitioners, health records officers, MoH officials, and DHIS2 administrators based in Uganda.
  While the findings may be nationally relevant, primary data collection will be limited to a representative sample of health facilities and TM practitioners in Central and Eastern Uganda, where TM usage is widespread.

1.6.3 Time Scope

The research covers the status of digital health systems from 2017 to 2025, which marks the period of major digital health reforms and system upgrades in Uganda, including the scaling of UgandaEMR. This scope allows for a current and retrospective analysis of the evolving digital infrastructure and its gaps.

1.6.4 Methodological Scope

The study adopted a mixed-methods approach, incorporating both qualitative and quantitative data:

- Quantitative methods: Collection and analysis of EMR usage statistics, system capability assessments, and health data records.
- Qualitative methods: Key informant interviews, focus group discussions with traditional healers and health workers, and policy document reviews. The design of the framework was guided by a design science methodology, emphasizing problem identification, framework design, validation, and refinement based on stakeholder feedback.

1.7 Definition of Key Terms

Term	Definition
Traditional Medicine (TM)	Indigenous healthcare knowledge, practices, and systems used in diagnosis, prevention, and treatment of diseases through plant, animal, or mineral-based medicines, spiritual therapies, or manual techniques.
UgandaEMR	The Electronic Medical Record system implemented by Uganda's Ministry of Health, primarily used in health centers for tracking patient data.
Health Management Information System (HMIS)	A system for collecting, storing, managing, and transmitting health-related information for decision-making and policy formulation.
Interoperability	The ability of computer systems or software to exchange and make use of information effectively and securely.
Integration Framework	A structured guide that enables the alignment and incorporation of different data types or systems into a unified platform.

CHAPTER TWO
Literature Review

2.1 Introduction

This chapter reviews existing literature to provide a comprehensive understanding of the design and integration frameworks relevant to incorporating traditional medicine data into Uganda's national health information systems. The integration of traditional medicine practices into formal health records is increasingly recognized as essential for holistic healthcare delivery, especially in contexts like Uganda where traditional medicine remains a primary source of care for a large proportion of the population. However, integrating this data presents technical, organizational, and socio-cultural challenges that require a deliberate and structured framework.

Previous research highlights that Uganda's health information landscape is characterized by fragmented systems tailored to donor requirements and vertical programs. This fragmentation leads to data silos, duplication, inconsistencies, and limits the interoperability of health information systems (Kiwanuka, 2021; Nabaggala, 2015). Traditional medicine data is rarely captured systematically within existing Health Management Information Systems (HMIS) or electronic medical record (EMR) platforms, such as the UgandaEMR, which primarily focus on biomedical data for communicable and non-communicable diseases (Akwaowo, 2022). The lack of standardized data formats, poor data governance, and insufficient technological infrastructure exacerbate these challenges, making it difficult to harness traditional medicine data for evidence-based decision-making and policy formulation (WHO, 2023).

Studies conducted on the adoption and sustainability of EMR systems in Uganda reveal several barriers that can equally affect the integration of traditional medicine data. These include limited internet connectivity, unreliable electricity supply, shortage of skilled healthcare workers, and concerns around data privacy and security (Akwaowo, 2022; Nabaggala, 2015). Furthermore, socio-cultural factors such as skepticism among biomedical practitioners about the legitimacy of traditional medicine, as well as patients' varied health-seeking behaviors, complicate the data integration process (Abraham, 2023). Lessons from successful EMR implementations in rural health centers emphasize that stakeholder engagement, infrastructure investment, continuous training, and government policy support are vital to overcoming these obstacles (Mark, 2023).

International standards and interoperability frameworks such as HL7 and FHIR have been proposed and adopted globally to facilitate seamless data exchange between heterogeneous health information systems (Blobel, 2018). However, adapting these frameworks to local contexts remains a challenge due to resource constraints and the unique nature of traditional medicine data, which often includes qualitative, non-standardized, and culturally specific information (Keenan, 2016). Thus, there is a critical need to develop a comprehensive, context-specific integration framework that aligns traditional medicine data capture with existing national HMIS and UgandaEMR systems, ensuring data interoperability, security, and usability.

Moreover, incorporating traditional medicine into national health data systems has the potential to improve health service delivery by offering a more inclusive picture of patient health, supporting research, and guiding policy formulation for integrative healthcare models. Addressing gaps in policy, data standards, infrastructure, and capacity are essential steps to achieving this goal (Kiwanuka, 2021; WHO, 2023). This review synthesizes lessons from related health information integration efforts, identifies key enablers and barriers, and underscores the importance of designing a sustainable integration framework that respects both technological and cultural considerations within Uganda's health system.

2.2 Theoretical Frameworks

This section outlines and critiques the theoretical models underpinning the study. Theories are essential in guiding research design, interpretation of findings, and framing recommendations. The integration of traditional medicine into Uganda's digital health infrastructure involves socio-technical, organizational, and cultural dynamics. Therefore, it is important to adopt a multi-theoretical approach. This study draws on four key models: Systems Theory, Technology Acceptance Model (TAM), Diffusion of Innovation Theory (DOI), and the Health Information Systems Strengthening Framework (HIS-SF). These theories collectively provide insight into how health systems operate, how users accept and adopt new technologies, how innovations spread, and how system-wide strengthening can occur.

2.2.1 Systems Theory

Systems Theory, originally proposed by Ludwig von Bertalanffy (1968), views organizations as open systems composed of interdependent subsystems that must work harmoniously for optimal performance. In healthcare, this theory emphasizes the interconnectedness of people,

processes, technologies, and policies. Applied to Uganda's HMIS, Systems Theory supports the notion that traditional medicine (TM) cannot be viewed in isolation but as part of the larger health system, which includes biomedical services, digital platforms like UgandaEMR, and national policies.

Contemporary studies such as Leischow et al. (2015) and Mutale et al. (2019) affirm the relevance of systems thinking in health information integration. They argue that fragmented data systems, such as those often found in developing countries, fail to function effectively because they neglect the systemic interdependence between data, infrastructure, and human behavior. Systems Theory suggests that integrating TM into UgandaEMR requires the alignment of technological capabilities, health worker practices, traditional healer workflows, and policy frameworks.

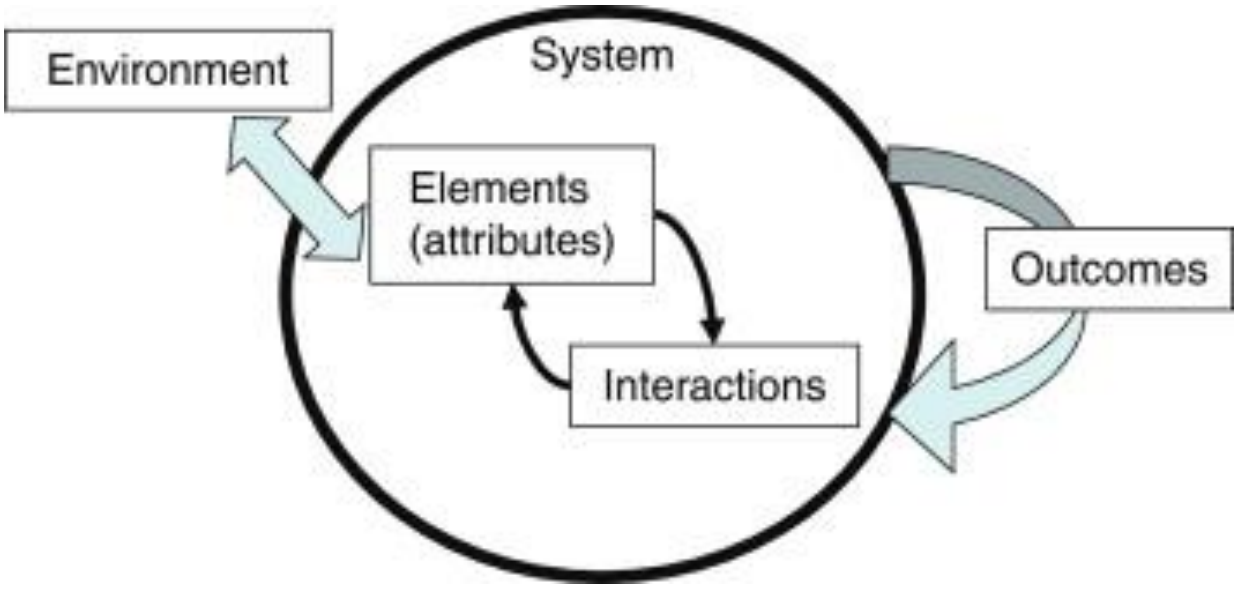


Fig 2.1: Systems Theory. (Source: Ludwig von Bertalanffy (1968))

However, Systems Theory is sometimes critiqued for being too abstract and not providing specific mechanisms for implementation. While it is effective in conceptualizing complexity, it may lack actionable detail when applied to specific interventions such as EMR integration (Barasa et al., 2018). Therefore, while Systems Theory frames the need for holistic integration, it must be complemented with more operational models like TAM or HIS-SF to guide practical implementation.

2.2.2 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), is one of the most widely used frameworks for predicting and explaining user behavior toward technology adoption. TAM proposes that two factors Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) determine an individual's intention to use a new system. This model is particularly relevant in understanding how traditional medicine practitioners, as well as health workers, might respond to a digitized system like UgandaEMR.

Recent studies such as Venkatesh & Bala (2020) and Bagayoko et al. (2017) have extended TAM in the context of health information systems in low-resource settings. They reveal that healthcare workers are more likely to adopt EMRs when they believe the systems will enhance their performance and when they find them user-friendly. For TM integration, the ease with which traditional healers can use digital systems is crucial, especially given their typically low digital literacy levels and the informal nature of their practice.

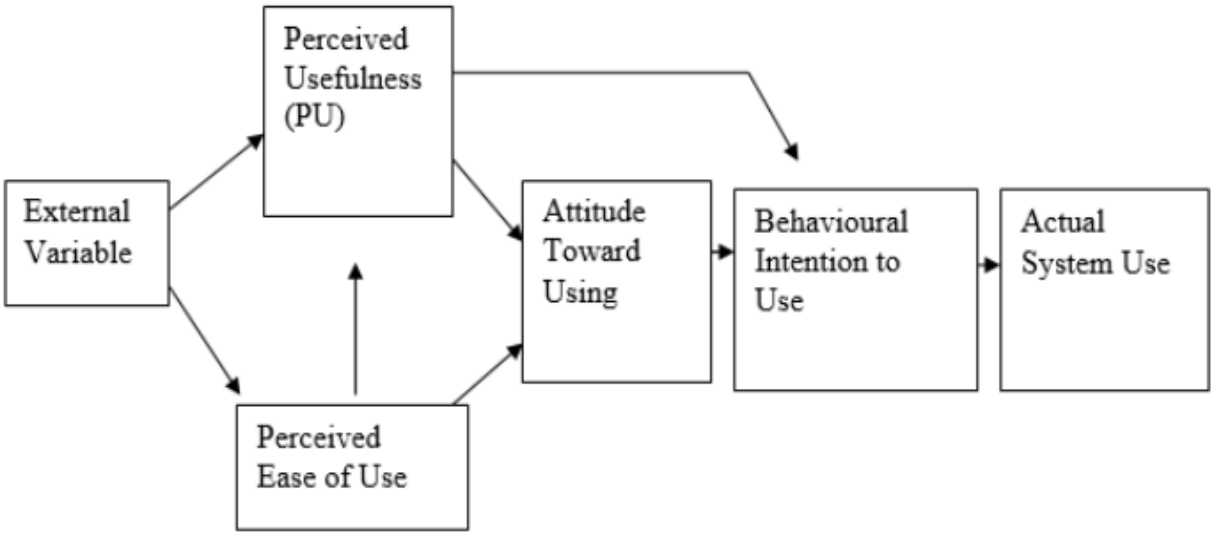


Fig 2.3: The Technology Acceptance Model (TAM). (Source: Davis, 1989)

Critics argue that TAM is overly individualistic and does not account sufficiently for environmental or cultural factors, which are central to traditional medicine settings (Holden & Karsh, 2015). It also tends to focus on intention rather than actual behavior, which may not fully translate into long-term use. In Uganda's context, integrating TM data requires more than just user acceptance; it requires system redesign, regulatory support, and inter-professional

collaboration, which TAM alone cannot fully explain. Nonetheless, TAM provides a useful micro-level lens on user engagement with EMRs.

2.2.3 Diffusion of Innovation Theory

The Diffusion of Innovation (DOI) Theory by Rogers (2003) explains how new ideas, practices, or technologies spread within a social system over time. DOI identifies five characteristics that influence adoption: relative advantage, compatibility, complexity, trialability, and observability. When applied to Uganda's health sector, DOI helps to explore how the innovation of integrating TM into EMRs could be communicated and adopted by various stakeholders, including traditional healers, health workers, and policymakers.

Empirical research by Greenhalgh et al. (2017) and Zulu et al. (2021) supports the usefulness of DOI in implementing health innovations in resource-limited environments. They show that innovations with perceived benefits and those compatible with existing cultural and workflow norms are more likely to be adopted. For example, if TM practitioners can clearly see the benefits of being digitally documented such as formal recognition or improved referrals they may be more willing to adopt EMR platforms.

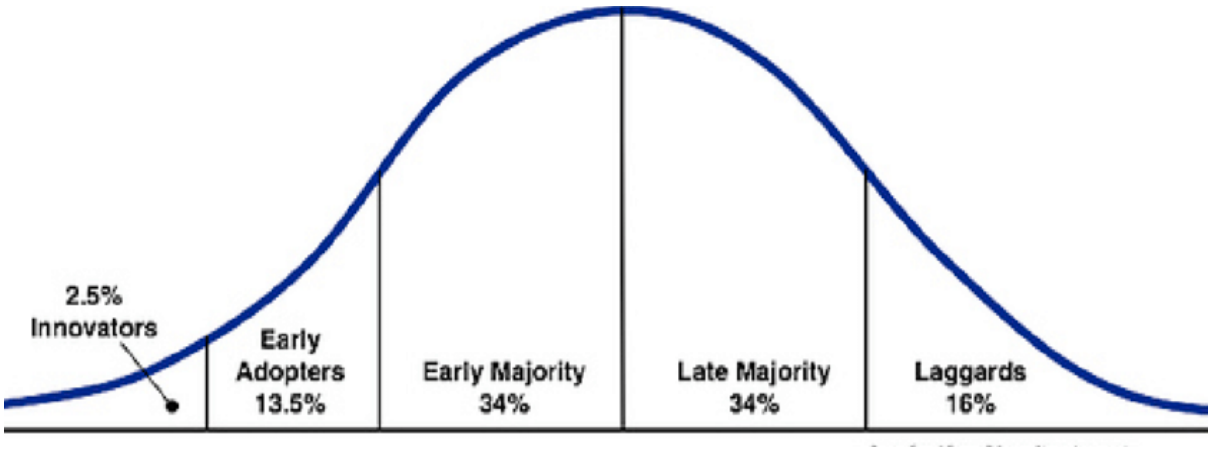


Fig 2.2: The Diffusion of Innovation (DOI) Theory by Rogers (2003)

However, DOI has been criticized for its assumption that innovation adoption is a linear process, which may not hold true in complex, culturally entrenched sectors like traditional medicine. Also, DOI underemphasizes power dynamics and structural barriers (e.g., lack of regulation, funding constraints), which are critical in the Ugandan context. Therefore, while DOI offers insights into stakeholder behavior, it must be situated within broader institutional and systemic considerations.

2.2.4 Health Information Systems Strengthening Framework (HIS-SF)

The Health Information Systems Strengthening Framework (HIS-SF) was introduced by WHO and MEASURE Evaluation to guide the development, evaluation, and sustainability of health information systems. It identifies six core components: governance, systems design, data sources, data management, data quality, and information use (MEASURE Evaluation, 2017). HIS-SF emphasizes the need for robust policy environments, capacity development, and feedback loops to ensure the sustainability of health information systems.

HIS-SF is highly applicable to the Ugandan context, where the integration of TM requires alignment with governance structures and existing data standards within UgandaEMR. For instance, the framework advocates for strong leadership from the Ministry of Health, clear standard operating procedures for data collection, and investment in health informatics capacity. Literature by Nutley & Reynolds (2019) and Musoke et al. (2022) demonstrates that countries using HIS-SF-based interventions report improved data reliability and health outcomes.

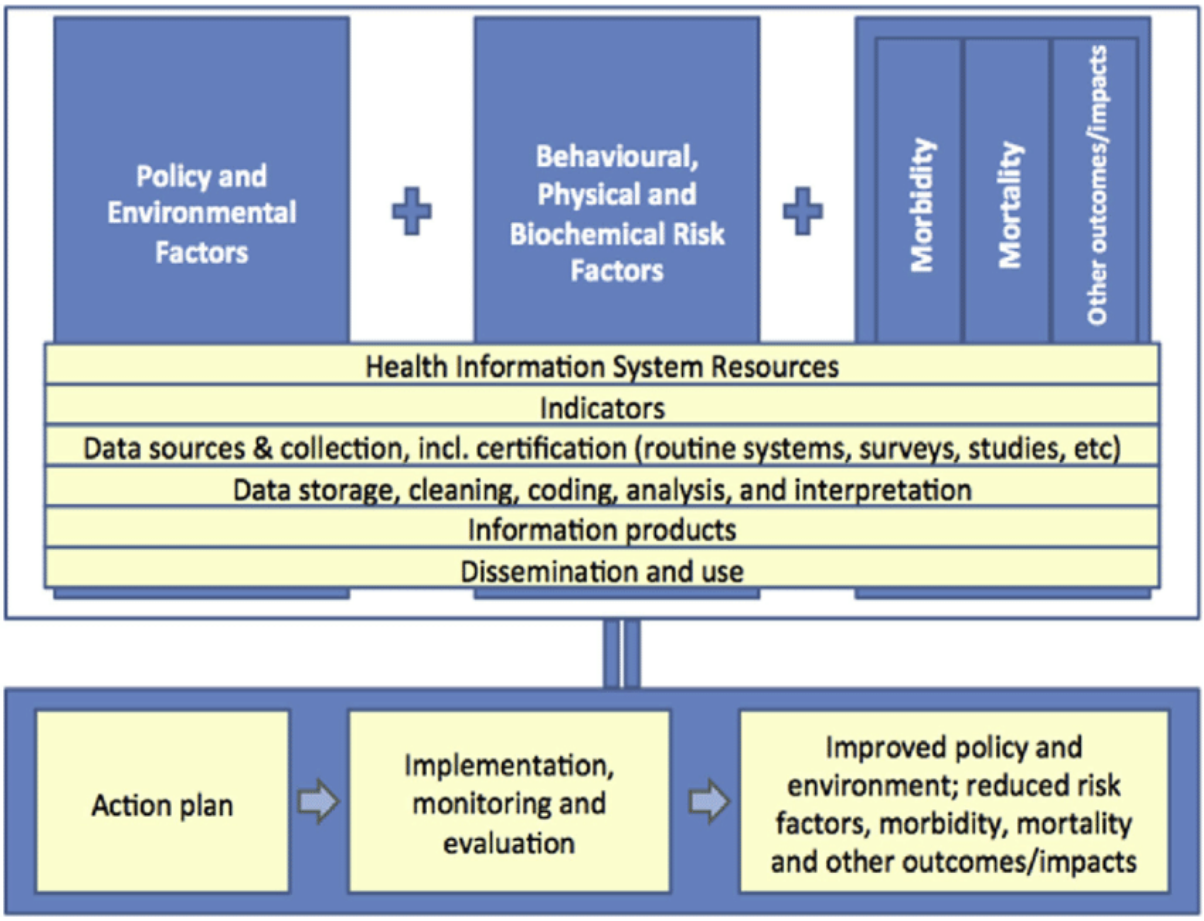


Fig 2.3: The Health Information Systems Strengthening Framework (HIS-SF)

Nonetheless, HIS-SF can be overly top-down, potentially neglecting grassroots realities such as the informal nature of TM practices or limited digital infrastructure in rural settings. Additionally, the framework assumes a level of government coordination that may not always be present in Uganda's fragmented health system. Despite these challenges, HIS-SF offers a macro-level roadmap to guide sustainable integration of TM into the national digital health architecture.

2.3 Conceptual Framework

The conceptual framework for this study depicts the interplay between technical, institutional, and cultural factors in determining the successful integration of Traditional Medicine (TM) into Uganda's electronic health records, specifically UgandaEMR. It is grounded in the study objectives and empirical findings, linking key barriers, system readiness, and stakeholder engagement to the adoption of a TM-inclusive EMR framework.

2.3.1 Independent Variables (IVs)

a) Technical Factors

Technical factors refer to the digital infrastructure and software capabilities that facilitate TM integration into UgandaEMR:

- **System interoperability:** The capacity of UgandaEMR to exchange data with other health systems and accommodate TM-specific information.
- **Infrastructure readiness:** Availability of electricity, reliable internet, computers, and mobile devices required for digital data capture and reporting.
- **System modifiability:** Flexibility to create TM-specific modules, forms, and workflows without disrupting existing EMR functions.

b) Institutional Factors

Institutional factors include policies, governance, and legal frameworks that influence TM data integration:

- **National integration policies:** Guidelines that support the inclusion of TM data within the national HMIS.
- **Regulatory support:** Oversight by the Ministry of Health and district health offices to promote TM digitization.
- **Legal frameworks:** Protection of patient confidentiality and intellectual property rights of TM practitioners.

c) Human and Cultural Factors

These encompass knowledge, skills, and socio-cultural attitudes affecting both TM practitioners and patients:

- **Digital literacy:** Ability of TM practitioners and health workers to use EMR tools effectively.
- **Patient beliefs and preferences:** Willingness of patients to have TM included in formal health records.
- **Cultural norms:** Practices and beliefs influencing the documentation, sharing, and standardization of TM knowledge.

2.3.2 Mediating Variable

Integration Process

The integration process represents the practical implementation of TM into UgandaEMR. It mediates the relationship between the independent variables and adoption of the EMR framework, involving:

- Development of TM-specific modules and data capture interfaces
- Stakeholder training and capacity-building initiatives
- System testing and iterative feedback loops
- Policy alignment and participatory governance mechanisms

This process ensures that technical gaps, socio-cultural resistance, policy limitations, and infrastructure challenges are addressed, enabling smoother adoption of the TM-inclusive EMR.

2.3.3 Dependent Variable

Adoption of a TM-Inclusive EMR Framework

The dependent variable is the nationwide adoption of an EMR framework that integrates both biomedical and TM data, allowing for:

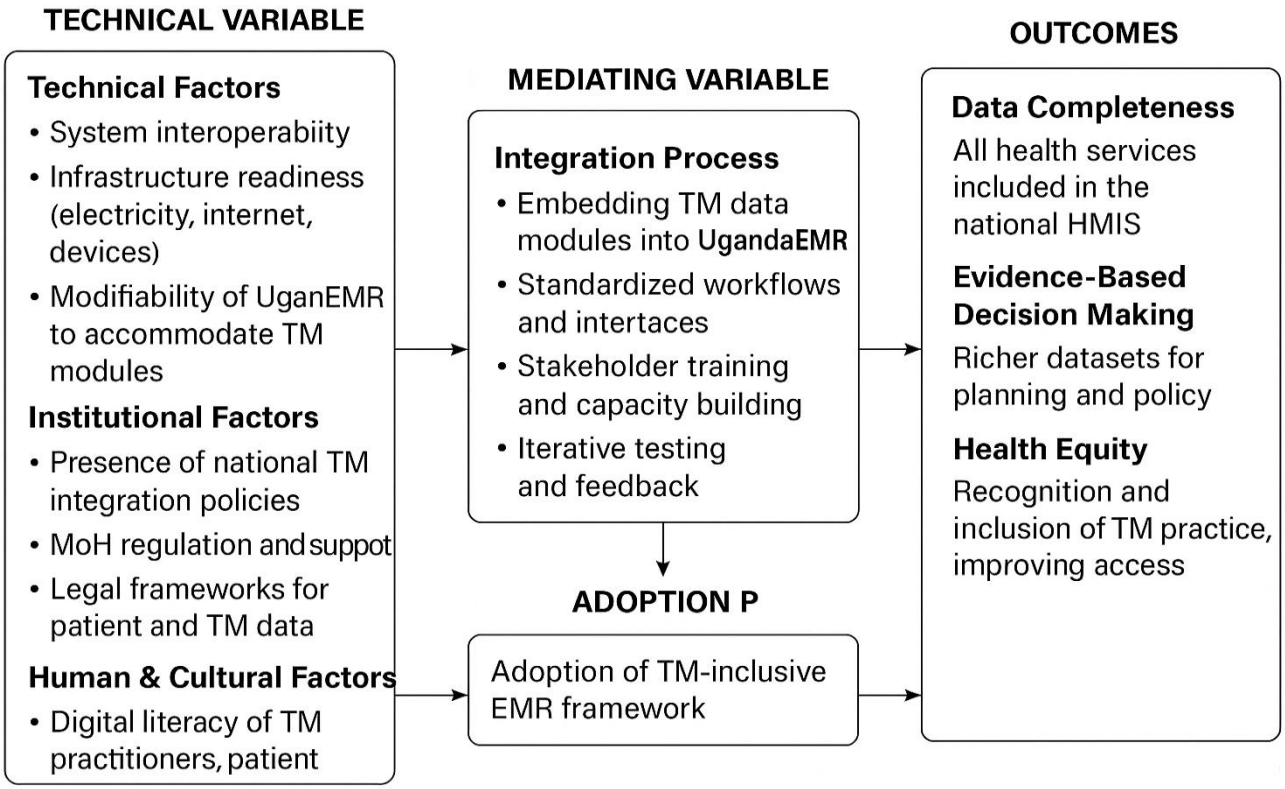
- Comprehensive patient care through consolidated health records
- Inclusive health planning and evidence-based policy-making
- Strengthened interoperability across health information systems

2.3.4 Expected Outcomes

Successful integration of TM into UgandaEMR is expected to yield:

- **Data completeness:** Full incorporation of health services, including TM, into national health records
- **Evidence-based decision-making:** Enhanced datasets supporting research, policy formulation, and health planning
- **Health equity:** Improved access to culturally appropriate care, particularly in rural and underserved communities
- **System sustainability:** Modular, scalable integration ensuring long-term, cost-effective EMR functionality

2.4.1 Objective 1: Challenges and Barriers to Integrating Traditional Medicine into HMIS



2.3 Literature Review Based on Study Objectives

2.3.1 Objective 1: Challenges and Barriers to Integrating Traditional Medicine into HMIS

2.3.1.1 Technical Barriers

One of the most critical technical challenges facing the integration of traditional medicine (TM) into Uganda's Health Management Information Systems (HMIS) is the lack of interoperability among existing platforms. Systems such as UgandaEMR, DHIS2, and other program-specific applications were originally designed for vertical health programs like HIV, TB, or maternal health and are often rigid in structure. These platforms lack modular designs that allow easy extension for new health data sources such as TM. Studies conducted by Musoke et al. (2022) and Bagayoko et al. (2017) have highlighted that fragmented system architectures prevent data harmonization, making it difficult to embed new workflows or entities.

Infrastructure gaps further exacerbate the situation. Most TM practitioners operate in rural or peri-urban areas with limited access to power, internet connectivity, and digital tools. According to WHO (2023), many low-income countries struggle to extend digital health infrastructure beyond urban zones, resulting in poor coverage where TM is most practiced. Additionally, existing EMR platforms are not optimized for offline functionality, which is crucial in remote areas. These infrastructural inadequacies lead to under-reporting, data loss, and uncoordinated care pathways.

2.3.1.2 Institutional Barriers

Institutional challenges largely stem from policy fragmentation, weak enforcement, and lack of clear ownership. Although Uganda enacted the Traditional and Complementary Medicines Act in 2019, the translation of this law into digital inclusion policies remains limited. The Ministry of Health's current eHealth policy does not explicitly define pathways for integrating TM into HMIS, leaving a significant gap in strategic direction (Uganda MoH, 2021). This regulatory vacuum discourages stakeholders, including TM practitioners, from engaging with formal health data systems.

Furthermore, coordination among government bodies, NGOs, and private sector players remains weak. Decentralized health governance in Uganda often leads to different regions

using varied tools and standards, further complicating any centralized TM data integration. The absence of harmonized data policies across sectors creates uncertainty over data ownership, security responsibilities, and validation procedures (Kiwanuka, 2021). Without institutional clarity and accountability, sustainable integration of TM into UgandaEMR remains elusive.

2.3.1.3 Socio-Cultural and Human Barriers

Cultural norms and human capacity gaps present some of the most complex barriers to TM integration. Many TM practitioners work informally, relying on oral tradition and secretive knowledge systems that resist documentation. These practices are rooted in trust-based healer-client relationships and spiritual interpretations that are difficult to capture within biomedical frameworks (Zulu et al., 2021). As such, there exists significant skepticism among traditional healers toward digitizing their work, fearing intellectual property theft, over-regulation, or cultural dilution.

On the other hand, the biomedical community in Uganda tends to view traditional medicine with suspicion, often questioning its legitimacy and scientific rigor. This mistrust leads to minimal collaboration or knowledge sharing, further isolating TM from formal health data streams. Additionally, low digital literacy among both TM practitioners and some health workers makes it difficult to implement user-friendly electronic platforms (Mutale et al., 2019). Without dedicated training and capacity-building efforts, even well-designed systems risk rejection or underutilization.

2.3.1.4 Data-Related Issues

Traditional medicine presents unique data-related challenges that go beyond technical and institutional factors. One of the primary difficulties is the qualitative, narrative-based nature of TM data, which contrasts with the structured data formats used in HMIS platforms. For instance, patient diagnoses in TM may not align with ICD-10 codes or SNOMED CT, making it difficult to classify and store TM cases within EMRs. As a result, there is a lack of standardized vocabularies, data dictionaries, or ontologies to support the semantic integration of TM practices (Keenan, 2016).

Moreover, TM data often includes multi-faceted variables such as herbal formulations, spiritual diagnoses, and traditional rituals, which do not fit neatly into existing health data schemas. Without standardized methods for coding and validation, such data is at risk of being dismissed

or misrepresented. This lack of structure hinders data quality assurance, limits comparability across facilities, and constrains analytics for policy-making. Additionally, concerns about data privacy and cultural sensitivity discourage practitioners from sharing details of their practices, especially in the absence of regulatory safeguards.

2.3.1.5 Summary of Practical Solutions Proposed in Literature

Despite these challenges, literature from Uganda and other LMICs has proposed several actionable solutions. First, the development of modular EMR platforms with configurable templates could accommodate the unique requirements of TM data while maintaining standardization for national reporting. For example, studies by Dehnavieh et al. (2018) emphasize the use of API-driven architectures and open-source platforms like OpenMRS for greater flexibility and customization.

Secondly, stakeholder engagement has emerged as a recurring recommendation. Co-design workshops involving TM practitioners, biomedical workers, and software developers can foster mutual understanding and generate culturally appropriate digital tools. Projects in South Africa and Ghana have demonstrated that involving traditional healers in the design and pilot stages enhances system adoption and data accuracy (WHO, 2024).

Additionally, the introduction of TM-specific training in health informatics for both practitioners and district health officers could help bridge the digital literacy gap. Complementary to this, legal protection for traditional knowledge through policies that guarantee data privacy and ownership would incentivize disclosure and participation. Lastly, international standards such as HL7 FHIR and SNOMED CT could be localized to reflect TM concepts, enabling interoperability while respecting cultural distinctiveness.

2.3.3 Objective 3: Stakeholder Engagement and Framework Validation

Effective integration of traditional medicine (TM) into Uganda's HMIS cannot occur without robust stakeholder engagement and iterative validation of the proposed framework. The literature highlights the importance of inclusive, participatory design and evidence-driven testing methods in ensuring the success, scalability, and sustainability of health information systems.

2.3.3.1 Stakeholder Roles

Stakeholder involvement is central to any successful health IT integration. In Uganda's context, the Ministry of Health (MoH) plays a leading policy and coordination role. It is responsible for developing national guidelines, mobilizing resources, and enforcing regulatory compliance across all health data systems (Uganda MoH, 2021). Traditional Medicine practitioners are equally important stakeholders as they are the primary source of TM knowledge and care delivery, especially in underserved areas. Their inclusion in design consultations ensures cultural appropriateness and increases ownership of the system.

ICT staff and system developers are tasked with customizing EMR platforms to support new data fields and functionalities. Their technical insight is critical in enabling interoperability and safeguarding data integrity. Biomedical workers, such as nurses and clinical officers, serve as key bridge actors between the formal health system and TM practices, especially in referral and co-treatment cases. Literature emphasizes the need for these professionals to be sensitized and trained on how TM data fits into holistic patient care (Zulu et al., 2021). Aligning the interests and responsibilities of these stakeholder groups enhances cooperation, streamlines implementation, and builds trust.

2.3.3.2 Lessons from Participatory Design in Health IT

Participatory design (PD) is an approach in which end users and stakeholders are actively involved in all phases of system development from needs assessment to prototyping and testing. Evidence from health IT projects in Kenya, Tanzania, and Ghana shows that PD enhances system relevance, user satisfaction, and sustainability (Scott et al., 2018; Musoke et al., 2022). Involving TM practitioners in co-design not only improves usability but also increases cultural acceptance and data accuracy.

PD also encourages mutual learning between stakeholders. For instance, digital developers gain insight into local healthcare practices and terminologies, while TM practitioners develop a better understanding of the value of structured data. Moreover, PD can uncover previously overlooked use cases, such as TM referrals or herbal drug monitoring, which are critical to integration. Despite its benefits, challenges remain such as power imbalances in decision-making and extended development timelines but literature suggests these can be mitigated by strong facilitation and capacity-building interventions.

2.3.3.3 Evaluation Methods for Health IT Feasibility and Impact

Feasibility assessments and pilot evaluations are essential components of framework validation. Health IT literature suggests a multi-method evaluation strategy combining qualitative and quantitative tools (Nutley & Reynolds, 2019). Feasibility can be assessed through usability testing, stakeholder feedback, and workflow analysis. For example, simulations of TM data entry into UgandaEMR prototypes can help identify pain points and gaps in logic or navigation.

Impact evaluation, on the other hand, can be conducted using frameworks like RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) or the Health Information Systems Performance Index (HISPI). These tools allow for measurement of system adoption, user experience, cost-effectiveness, and health outcomes. In contexts where digital literacy is low, proxy indicators such as improved referral rates or increased MoH engagement with TM data may serve as early success signals. A phased rollout with iterative feedback loops ensures adaptive improvements and builds evidence for scale-up.

2.3.3.4 Case Studies on Framework Testing and Iteration

Several case studies offer valuable lessons on framework testing and iteration. In Ghana, the Ministry of Health collaborated with TM associations and universities to pilot a TM registry and data capture system in 2018. After identifying usability issues and data entry inconsistencies, the system was revised to include audio note features and simplified treatment categories (WHO, 2023). This iterative process led to wider acceptance among herbalists and more structured data for policymakers.

India's AYUSH Grid initiative also offers insights into large-scale integration. The system was piloted in rural states like Kerala and Uttar Pradesh, where feedback from Ayurvedic practitioners led to changes in taxonomy, language options, and integration with pharmacy modules. In Uganda, smaller digital health interventions like the e-MCH digital maternal tool in Soroti demonstrate that local user testing and validation can significantly enhance system relevance and uptake (Kiwanuka, 2021).

2.4 Related Studies and Empirical Evidence

A rich body of empirical literature has emerged over the past decade, examining electronic medical record (EMR) adoption, traditional medicine governance, and health information system development across Uganda, Sub-Saharan Africa, and globally. These studies provide a foundation for understanding the opportunities and gaps in integrating TM into national HMIS platforms like UgandaEMR.

2.4.1 Local Studies (Uganda)

Local studies on EMR adoption in Uganda identify common challenges such as poor infrastructure, staff shortages, fragmented systems, and poor user engagement. Akwaowo (2022) and Nabaggala (2015) highlight how most EMR deployments have been driven by donor priorities rather than national integration strategies. There is also a dearth of research on documenting TM within digital systems, with most studies focusing on the biomedical sector.

Notably, Kiwanuka (2021) discusses the lack of standardized protocols for TM data collection and limited engagement with TM associations during policy formulation. These gaps have contributed to persistent exclusion of TM from Uganda's mainstream digital health transformation. Furthermore, empirical evidence shows that TM practitioners remain unregulated in many districts, limiting the MoH's ability to engage them in structured data efforts.

2.4.2 Regional Studies (Sub-Saharan Africa)

Countries like Ghana, Kenya, and South Africa have made significant strides in bridging the gap between traditional and modern healthcare systems. In Ghana, the integration of TM into national health policy included establishing herbal units in public hospitals and a pilot database of registered healers. Kenya's mHealth initiatives for traditional birth attendants and herbalists have shown promise in promoting documentation and digital literacy (Scott et al., 2018).

In South Africa, the co-referral system between traditional and biomedical practitioners in KwaZulu-Natal offers a working model for mutual recognition and patient safety. While these interventions are promising, many of them face sustainability challenges due to lack of funding and poor system interoperability. Nonetheless, these studies demonstrate that TM integration is achievable when supported by strong institutional frameworks, community engagement, and

adaptable technologies.

2.4.3 International Comparisons: China, India, Latin America

Internationally, China and India stand out as leaders in TM integration. China's health system seamlessly incorporates Traditional Chinese Medicine (TCM) into hospital EMRs, insurance systems, and national health research platforms. Standardized terminologies and cross-practitioner referrals have enhanced data completeness and patient care.

India, through the Ministry of AYUSH, has built a multi-layered digital health architecture that includes TM registries, health apps, and institutional EMRs. Both countries benefit from strong political will, investment in infrastructure, and TM formalization. In Latin America, countries like Brazil and Peru have adopted community-based digital tools to document traditional therapies, especially in indigenous populations. These models show that localized adaptations and robust regulatory environments are key to integration success.

2.4.4 Summary of Findings from Empirical Literature

Across contexts, empirical literature reveals that TM integration is both necessary and feasible but remains underexplored in formal digital health systems. Key enablers include modular and interoperable systems, participatory design approaches, clear regulatory mandates, and continuous capacity building. Barriers, on the other hand, include system fragmentation, lack of standardized data models for TM, digital illiteracy, and limited stakeholder coordination.

While Uganda shares many of these challenges with other countries, its growing investment in UgandaEMR and the formal recognition of TM through the 2019 Act provide a strong foundation for future integration. However, the absence of a validated national framework remains a critical gap. This study addresses that gap by synthesizing these lessons to propose a context-sensitive model grounded in local realities and global best practices.

2.5 Gaps in the Literature and Contribution of the Study

Despite increasing global interest in integrating Traditional Medicine (TM) into national health information systems, significant knowledge and practice gaps remain especially within the Ugandan context. This section highlights these gaps, informed by the preceding literature review, and outlines the specific contributions this study seeks to make in addressing them.

2.5.1 Identified Gaps in Current Integration Frameworks

Most existing integration frameworks, such as the Health Metrics Network (HMN) and the Global Resource Integration Model (GRIM), are broad in design and primarily address biomedical health data. While they promote interoperability, standardization, and governance, they largely omit culturally grounded health practices like TM. These frameworks tend to assume structured, codified data flows, which are often incompatible with the qualitative, unstructured nature of TM records. This misalignment limits their utility for countries like Uganda, where a large portion of the population relies on traditional healthcare services. There is an evident absence of TM-specific models that consider the socio-cultural and technical uniqueness of local health systems.

2.5.2 Absence of Locally Grounded TM Integration Models

Although Uganda legally recognizes TM through the Traditional and Complementary Medicines Act (2019), no comprehensive model exists for integrating TM data into the Uganda Electronic Medical Records (UgandaEMR) platform or the broader Health Management Information System (HMIS). Empirical evidence from Uganda (e.g., Kiwanuka, 2021; Akwaowo, 2022) focuses heavily on infrastructure or biomedical EMR challenges without addressing the integration of traditional care data. Furthermore, global models like India's AYUSH and China's TCM are often referenced as best practices, yet they are not directly transferable to Uganda without adaptation to local cultural norms, health-seeking behaviors, and technical limitations. This gap highlights the urgent need for a framework rooted in Uganda's institutional, cultural, and technological realities.

2.5.3 Weak Stakeholder Engagement in Framework Validation

Another recurring gap is the insufficient stakeholder involvement in the design, testing, and validation of integration frameworks. Most existing systems are top-down in nature, with little or no input from traditional healers, patients, or community-based health providers. Studies from both Uganda and other Sub-Saharan African countries indicate that failure to engage users especially TM practitioners often results in low adoption rates, data quality issues, and system underutilization. The lack of participatory design methodologies in prior initiatives weakens sustainability and limits the cultural acceptability of proposed frameworks.

2.5.4 Lack of Scalability and Interoperability Considerations for UgandaEMR

While UgandaEMR has been moderately successful in managing HIV, TB, and maternal health data, it was not originally built to be modular or scalable. Integration of TM would require not only new data schemas but also a flexible back-end capable of accepting heterogeneous data types. Most studies in Uganda (Akwaowo, 2022; Abraham, 2023) point to poor interoperability among systems as a persistent issue, yet none offer clear technical pathways for expanding UgandaEMR to accommodate TM data. This highlights a lack of applied research focusing on system architecture design for inclusive digital health ecosystems.

2.5.5 Study's Contribution to Bridging the Gaps

This study addresses the aforementioned gaps by developing a locally grounded, stakeholder-informed, and technically feasible framework for integrating TM into Uganda's EMR ecosystem. It contributes to policy by aligning its recommendations with the Traditional and Complementary Medicines Act (2019) and the National eHealth Strategy. Technically, the study proposes a modular architecture compatible with UgandaEMR, informed by global standards like HL7 FHIR but adapted to suit local limitations. Culturally, the framework is designed through a participatory process involving TM practitioners, ICT professionals, and Ministry of Health officials, ensuring that cultural beliefs, terminology, and confidentiality norms are respected. By bridging policy, technical, and cultural divides, this research offers a novel, scalable model for inclusive healthcare digitization in Uganda.

2.6 Summary Table of Identified Gaps

Study/Author	Context	Focus Area	Key Findings	Identified Gap	Relevance to Current Study
Kiwanuka (2021)	Uganda	EMR Fragmentation	Systems lack TM data inclusion	No TM-specific framework in UgandaEMR	Confirms need for customized integration
WHO (2023)	Global	TM Inclusion in HIS	Recommends TM inclusion in HIS	No local case application for Uganda	Validates importance of TM integration
Nguyen et al. (2021)	LMICs	GRIM Model	Offers modular, scalable HIS integration model	Requires local adaptation for TM	Inspires technical framework adaptation
Abraham (2023)	Uganda	Socio-Cultural Barriers	TM practitioners excluded from digital health efforts	No modeling of cultural data and user engagement	Emphasizes participatory design importance
Akwaowo (2022)	Uganda	EMR Infrastructure Gaps	UgandaEMR poorly resourced and siloed	Ignores TM, lacks interoperability	Highlights foundational technical challenges
Keenan (2016)	Global	TM Data Standards	TM data is qualitative and non-standardized	No coding/taxonomy frameworks for TM	Reinforces need for TM data modeling and terminology

CHAPTER THREE
Research Methodology

3.1 Introduction

This chapter presents the methodological framework adopted to achieve the objectives of the study, which focused on developing a technical integration framework for Traditional Medicine (TM) data within Uganda's Health Management Information System (HMIS), with emphasis on the Uganda Electronic Medical Records (UgandaEMR) platform. The methodology describes the philosophical orientation, research approach, design, methodological choice, sampling strategy, and the tools used for data collection and analysis. The chapter also outlines measures undertaken to ensure validity, reliability, ethical integrity, and alignment with the research objectives. All methods were selected to ensure that the framework produced is evidence-based, technically sound, and contextually relevant to Uganda's digital health ecosystem.

3.2 Research Philosophy

The study was guided by pragmatism, which prioritizes practical solutions to real-world technical challenges. Pragmatism was suitable because the research focused on solving a technical integration problem requiring both empirical insights (from UgandaEMR system documentation, policy guidelines, and IT staff) and functional requirement inputs (from system users, administrators, and TM stakeholders). The pragmatic stance allowed the researcher to combine qualitative and quantitative data to inform technical requirements and framework design while maintaining focus on actionable system-level outcomes.

3.3 Research Approach

An inductive research approach was adopted. Since the integration of TM data into UgandaEMR is a relatively new and under-documented area, induction allowed technical requirements and framework components to emerge from system data, stakeholder inputs, and interoperability considerations, rather than being imposed from existing theories. Patterns and categories were derived from:

- System documentation and architecture
- Stakeholder inputs on functional requirements and module design
- International best practices on digital health interoperability

These were consolidated into a context-specific technical framework for TM data integration.

3.4 Research Design and Strategy

The study followed an exploratory technical case study design, with UgandaEMR serving as the central case. This design enabled detailed investigation of system architecture, data standards, workflows, and interoperability challenges relevant to TM data inclusion.

The research strategy combined:

1. Document review: UgandaEMR manuals, Ministry of Health guidelines, and WHO standards
2. Technical stakeholder interviews: System developers, administrators, IT officers
3. Structured surveys: To validate and prioritize identified technical requirements

This design ensured both depth (qualitative requirement elicitation) and breadth (quantitative validation), with the ultimate goal of producing a scalable technical framework for TM data integration.

3.5 Methodological Choice

A mixed-methods approach was used, with a qualitatively driven design (QUAL → quan). The qualitative component (interviews and document review) generated technical requirements, while the quantitative component (structured surveys) validated and ranked these requirements in terms of feasibility and scalability.

Although stakeholders were consulted, this was not for behavioural modelling. Their inputs were limited to defining functional and non-functional requirements, identifying technical barriers, and validating framework feasibility. The ultimate orientation remained the development of a technical integration model.

3.6 Study Area and Context

The study was conducted in Uganda, with a focus on districts and institutions involved in the use of the UgandaEMR system. Specific attention was given to MoH offices, regional referral hospitals, selected public health facilities, and traditional medicine associations. These sites were selected because they represented the convergence of digital health systems, policy-making, and indigenous health practices. The inclusion of both urban and rural settings enabled the study to capture a diverse range of experiences and constraints, particularly those affecting the scalability and sustainability of TM data integration.

3.7 Study Population and Sampling

The study population consisted of stakeholders with direct technical or functional roles in UgandaEMR or TM service documentation. This included: UgandaEMR developers and system administrators, MoH policymakers and HMIS officers, Health facility managers and IT staff and Representatives of TM associations (for defining data elements and reporting workflows).

3.7.1 Sampling Method

Purposive sampling was employed to select participants with specialized knowledge on UgandaEMR design, HMIS policies, or TM service delivery. Representation was ensured across institutional roles, regions, and levels of responsibility.

3.7.2 Sample Size Determination

The Yamane (1967) formula was applied for guidance, using an estimated population of 75 stakeholders and a 0.05 margin of error. The target sample size was 63; 62 valid responses were obtained

$$n = \frac{N}{1 + N(e)^2}$$

Where:

- n = sample size

- N = population size (approx. 75 relevant stakeholders)
- e = margin of error (0.05)

$$n = \frac{75}{1 + 75(0.05)^2} = \frac{75}{1.1875} \approx 63$$

Based on this calculation, the target sample size was approximately 63 participants. A total of 62 responses were successfully obtained and analysed.

3.7.3 Summary of Sample Composition

Stakeholder Group	**Target (n)**	**Actual (n)**
Traditional medicine practitioners	22	21
Health facility staff (UgandaEMR users)	25	24
District health information officers	8	7
UgandaEMR developers/system admins	6	6
MoH policymakers	4	4
Total	**65**	**62**

This distribution ensured technical and policy perspectives were captured.

This distribution ensured a balanced perspective from both conventional and traditional health sectors and covered both technical and policy levels.

3.8 Data Collection Methods

The study employed a mixed-methods data collection strategy that incorporated both primary and secondary data sources**.** This approach was chosen to ensure triangulation and to capture the multifaceted realities surrounding the integration of traditional medicine (TM) data into Uganda's HMIS through UgandaEMR.

3.8.1 Primary Data

3.8.1.1 Semi-Structured Interviews

Semi-structured interviews were conducted with key informants who had strategic or operational roles in Uganda's health information systems and TM regulation. These included senior officials from the Ministry of Health (MoH), UgandaEMR developers, district health information officers, and representatives from traditional medicine associations. The interviews aimed to elicit rich, qualitative insights into the barriers, opportunities, and systemic readiness for TM data integration.

Interview guides were developed in line with the study objectives and were reviewed by domain experts for content validity. Interviews were audio-recorded (with consent), transcribed, and later analyzed thematically.

3.8.1.2 Structured Surveys

A structured questionnaire was administered to a purposively selected group of 62 participants, comprising healthcare workers, health information management staff, and traditional healers. The tool was digitized and deployed via KoboToolbox, allowing for efficient data collection, real-time monitoring, and reduction of manual entry errors.

The survey consisted of both closed-ended and open-ended questions. Closed-ended questions facilitated the collection of quantitative data, such as frequencies and Likert-scale ratings, while open-ended responses provided contextual depth. The instrument was pilot-tested before deployment to improve clarity, flow, and reliability.

3.8.2 Secondary Data

To supplement the primary data, the study reviewed a range of secondary sources, including:

- UgandaEMR developers and system administrators.
- MOH policymakers and HMIS officers.
- Health facility managers and IT staff.
- Representatives of TM associations (for defining data elements and reporting workflows).

These materials were critically examined to contextualize the primary findings and to inform the design and validation of the proposed integration framework.

Objective-Wise Mapping of Data Collection Tools

Objective	**Data Collection Methods**	**Target Respondents**
1. Identify barriers to TM integration	Semi-structured interviews; Surveys	TM practitioners, MoH officials, HMIS officers
2. Design integration framework	Document review; Key informant interviews	UgandaEMR developers, policymakers
3. Validate proposed framework	Stakeholder consultation workshops; Survey feedback	MoH representatives, TM leaders, health IT and HMIS staff

3.9 Data Analysis Techniques

The collected data were analyzed using both qualitative and quantitative techniques, in alignment with the study's mixed-methods design. Analysis was guided by the research questions and aimed at uncovering both patterns and meaning in the responses.

3.9.1 Qualitative Data Analysis

Interview transcripts and open-ended survey responses were analyzed using thematic coding, with categories such as:

- Functional requirements (data elements, reporting formats).
- Non-functional requirements (security, usability, scalability).
- Technical barriers (infrastructure, interoperability, standardization).

NVivo software was used to code and visualize thematic relationships, ensuring systematic synthesis.

Where applicable, qualitative analysis software such as NVivo was used to facilitate systematic coding and visualization of thematic relationships. This helped in organizing insights around key concepts such as technical barriers, socio-cultural resistance, and institutional readiness.

3.9.2 Quantitative Data Analysis

Survey data were analyzed using SPSS and STATA. Techniques included:

- Descriptive statistics (frequencies, means, standard deviations) to summarize technical readiness.
- Cross-tabulations & Chi-square tests to examine associations between stakeholder roles and perceptions of feasibility.
- Consensus scoring to prioritize requirements and assess overall feasibility of the framework.

These analyses enabled data-driven conclusions and informed the refinement of the final framework.

Objective-Wise Mapping of Data Analysis Techniques

Objective	Analysis Techniques	Expected Output
1. Identify barriers	Thematic analysis; descriptive statistics	Typology of challenges (technical, policy, cultural, human)
2. Design framework	Content synthesis; thematic abstraction	Draft integration model & structural elements
3. Validate framework	Cross-tabulation; consensus scoring	Feasibility metrics, acceptance indicators, alignment scorecards

3.9.3 Expert Validation and Refinement

To further strengthen the framework's applicability and robustness, an expert validation phase was undertaken following the initial framework development. This involved presenting the draft framework to a panel of experts, including UgandaEMR developers, Ministry of Health information officers, traditional medicine practitioners, and digital health researchers familiar with HMIS integration challenges. Experts were asked to critically review the framework, identify gaps or inconsistencies, and provide recommendations for improvement.

Feedback was collected through structured forms and follow-up consultations, allowing for iterative refinement of the framework. This expert approach ensured that the framework was both technically feasible and contextually relevant, bridging the gap between theory and

practice. It also fostered stakeholder buy-in, which is critical for future implementation and scalability within Uganda's health information ecosystem.

The framework validation employed a multi-phase approach to ensure technical feasibility, contextual relevance, and practical applicability:

Phase 1: Expert Panel Validation

- **Expert Selection Criteria**: Experts were selected based on minimum 5 years experience in health informatics, HMIS implementation, or traditional medicine integration
- **Validation Process**: Structured evaluation using predefined criteria including technical accuracy, completeness, feasibility, and alignment with national health policies
- **Validation Instruments**: Standardized evaluation forms with Likert scales (1-5) for quantitative assessment and open-ended questions for qualitative feedback
- **Panel Composition**: 12 experts including UgandaEMR developers (n=3), MoH health information officers (n=4), traditional medicine practitioners (n=3), and digital health researchers (n=2)

Phase 2: Technical Validation

- **System Compatibility Testing**: Framework components tested against current UgandaEMR architecture specifications
- **Data Flow Validation**: Proposed data integration pathways validated through system modelling and workflow analysis
- **Interoperability Assessment**: Framework alignment verified against HL7 FHIR and other relevant health data standards

Phase 3: Stakeholder Validation

- **End-User Feedback**: Framework usability and practicality assessed through structured interviews with potential system users
- **Implementation Feasibility**: Validation of resource requirements, timeline estimates, and organizational readiness factors

- **Contextual Relevance**: Framework appropriateness evaluated within Uganda's health system context and policy environment

3.10 Validity, Reliability, and Trustworthiness

To ensure the credibility and dependability of the research findings, several strategies were employed:

- Triangulation: Data were triangulated across methods (interviews, surveys, and document reviews) and sources (MoH, TM practitioners, developers) to validate emerging themes and findings.
- Member Checking: Selected respondents were re-engaged to verify the accuracy of transcribed data and to clarify ambiguous responses, thereby enhancing interpretive reliability.
- Expert Validation: The semi-structured interview guide and the integration framework draft were reviewed by domain experts from the Ministry of Health and university health informatics faculty for relevance and applicability.
- Pilot Testing: The survey instrument was pilot-tested with a small representative sample to refine question clarity, reduce ambiguity, and ensure instrument reliability.

Together, these techniques bolstered the methodological rigor and ensured that the data accurately reflected the perspectives of the diverse stakeholder groups involved in the study.

3.11 Ethical Considerations

The ethical integrity of this study was safeguarded by obtaining clearance from the Uganda Martyrs University Research Ethics Committee, ensuring that the study adhered to approved protocols and national research standards. Before data collection commenced, informed consent was obtained from all participants, with the objectives of the study clearly explained. Participants were assured of their right to withdraw at any stage without consequence.

To uphold confidentiality, no personally identifiable information was disclosed in the findings or analysis. All data was anonymized, stored securely, and accessed only by authorized research personnel. In alignment with data protection protocols, electronic data was password-protected and stored on encrypted devices. The data collection process also incorporated the

use of secure tools, such as Kobo Toolbox, to reduce risks associated with data breaches or unauthorized access. The adherence to ethical norms enhanced the credibility of the findings and strengthened stakeholder confidence in the study.

3.12 Time Horizon

This research adopted a cross-sectional time horizon, meaning that data was collected at a single point within one research cycle. This design allowed for a snapshot assessment of stakeholder perspectives, institutional readiness, and challenges relating to the integration of Traditional Medicine (TM) data into Uganda's EMR system.

The one-month data collection period, as detailed in section 4.1.3, was sufficient to gather valid and representative data from targeted stakeholders. The time-bound nature of the design ensured practical feasibility within the constraints of academic timelines, while also allowing adequate representation of real-world challenges and perceptions during the study window.

3.13 Research Questions

The research addressed the following technical research questions:

1. What are the technical barriers (data standards, interoperability, infrastructure) to integrating TM data into UgandaEMR?
2. What system requirements (data elements, reporting formats, workflows) must be considered for successful integration?
3. How feasible and scalable is the proposed technical integration framework within Uganda's HMIS?

3.14 Limitations and Delimitations

While the study offers practical insights into TM data integration, several limitations were acknowledged:

- Scope Restriction: The study focused exclusively on UgandaEMR, a national platform. Other private or community-based EMR systems were not included, which limits the breadth of system comparisons and may exclude alternative integration pathways.
- Geographical & Cultural Boundaries: Since the study was conducted within Uganda, and with particular engagement from key Ministry of Health and facility stakeholders,

generalizability to other countries or health systems is limited due to unique socio-cultural contexts and policy environments.

Despite these limitations, the study was deliberately delimited to UgandaEMR because of its national relevance and alignment with the Ministry of Health's official HMIS strategy. Furthermore, by focusing on UgandaEMR, the study offers **deep contextual insights** into systemic, infrastructural, and stakeholder issues affecting TM data inclusion.

3.15 Workplan and Timeline

To ensure structured implementation of research activities, a detailed workplan was developed, covering each phase from proposal development to final write-up. The visual Gantt chart in

Figure 1 illustrates the sequence and time allocation of key milestones:

Activity	**Timeline**
Proposal development	Month 1
Ethical clearance	Month 2 (early)
Tool design & pilot testing	Month 2 (mid)
Data collection	Month 3
Data analysis	Month 4
Report writing	Month 5–6

The workplan facilitated timely execution, and its structure allowed for flexibility, especially during the iterative phases of data collection and analysis. The phased approach design, pilot, collect, analyze echoes the structure of section 4.1.3, where a systematic rollout of survey instruments ensured data quality and response completeness.

3.16 Budget

A detailed budget was developed to cover all expected research activities, ensuring that each phase was adequately resourced. The breakdown is reflected in Figure 1, and key cost categories included:

Category	**Estimated Cost (UGX)**
Transport (fieldwork)	1,200,000
Printing & photocopying	400,000
Communication (calls/emails)	300,000
Stationery & logistics	250,000
Data transcription & cleaning	600,000
KoboToolbox subscription	Free (Open-source)
Contingency	250,000
Total	**3,000,000**

The budget planning accounted for the realities of field data collection, especially in engaging diverse stakeholders such as traditional medicine practitioners who required face-to-face follow-up, as detailed in the findings (Section 4.1.3). The cost-conscious design ensured value for money, leveraging free digital tools (like KoboToolbox) and minimizing manual errors during data entry.

CHAPTER 4
Presentation of Research Findings

4.0 Introduction

This chapter presents findings from the study on developing a technical framework for integrating Traditional Medicine (TM) data into Uganda's Health Management Information System (HMIS), with a focus on the UgandaEMR platform. All results are explicitly linked to the study's conceptual framework, which considers technical, institutional, and cultural/human factors as key independent variables, the integration process as the mediating variable, and adoption of a TM-inclusive EMR framework as the dependent variable.

Data were collected through document review, semi-structured interviews with technical stakeholders, and structured surveys assessing system readiness, infrastructure, and policy alignment. The results are presented along three dimensions: technical feasibility, institutional readiness, and framework validation, ensuring alignment with the intended final technical outcome.

The main objectives were to;

i. Identify and analyze the key barriers and challenges to integrating Traditional Medicine (TM) data into Uganda's Health Management Information System (HMIS), with a focus on technical, socio-cultural, policy, and infrastructure constraints.
ii. What framework can be developed to integrate TM data into HMIS in a way that addresses the identified barriers and strengthens stakeholder capacity and participation?
iii. Validate the proposed integration framework through stakeholder engagement, focusing on system adaptability, cost-effectiveness, institutional and political support, and inclusion of TM practitioners in policy development.

4.1 Data Collection Procedures

The data collection procedures were carefully designed to align with the study's overarching aim of assessing the feasibility of integrating Traditional Medicine (TM) data into Uganda's health information systems. A mixed-method approach, grounded in semi-structured digital surveys, was employed to gather context-rich data from a purposively selected group of stakeholders directly involved in health information systems and traditional medicine.

4.1.1 Data Sources

This study relied exclusively on primary data sources to ensure authenticity, relevance, and direct contextual linkage to the research objectives. The respondents were purposively selected from key stakeholder groups actively participating in Uganda's healthcare and traditional medicine ecosystems. These included:

- UgandaEMR developers, who provided technical perspectives on system design and data standards;
- Ministry of Health (MoH) officials, who contributed policy and regulatory insights;
- Facility-based health workers, representing operational users of the existing HMIS;
- Traditional medicine practitioners, offering cultural and experiential input on data sharing and documentation norms.

By engaging this range of actors, the study captured diverse perspectives on the operational, technical, institutional, and socio-cultural issues influencing TM data integration. The approach also ensured that responses were grounded in real-world experience and not merely speculative or theoretical. This enriched the study's findings and improved the robustness of the eventual framework recommendations.

4.1.2 Data Collection Method and Tool

A semi-structured digital questionnaire was developed as the principal tool for data collection. This tool was specifically designed to capture both quantitative trends and qualitative insights. The questionnaire featured:

- Closed-ended questions, which allowed for standardization, statistical analysis, and comparability across responses;

- Open-ended questions, which invited participants to elaborate on challenges, perceptions, and proposed solutions related to the inclusion of TM data in UgandaEMR.

To facilitate efficient and geographically inclusive data collection, the survey was digitally deployed via KoboToolbox, a mobile-based data collection platform that supports offline functionality. This platform was particularly suited for the study due to its:

- Error reduction through automated skip logic and mandatory fields;
- Real-time data syncing, which enabled daily monitoring of response progress;
- User accessibility, especially in remote areas with limited internet connectivity.

This combination of a flexible questionnaire and robust digital platform contributed to the collection of high-quality, accurate, and diverse data.

4.1.3 Survey Administration Timeline

The survey administration was executed over a four-week period, following a structured and phased schedule to maximize participation and ensure tool refinement. The timeline consisted of the following stages:

- Week 1 – Instrument Design and Piloting: The questionnaire was drafted, peer-reviewed for clarity and relevance, and pilot-tested with a small sample of stakeholders. Feedback from this stage was used to revise and finalize the instrument before full deployment.
- Week 2 – Launch and Distribution: The finalized digital survey was disseminated to selected participants via direct email links and SMS invitations. Key stakeholders across both traditional and formal healthcare sectors were targeted.
- Weeks 3 and 4 – Follow-Up and Response Optimization: Systematic follow-up was conducted through phone calls and reminder emails. Participants were provided with technical support on completing the survey where needed. These efforts contributed to a high response rate and robust data coverage.

This phased approach allowed for early detection of issues in survey administration, ensured participant engagement, and supported comprehensive data collection.

4.1.4 Description of Survey Participants

A total of 62 stakeholders with direct technical roles or operational knowledge of UgandaEMR or TM documentation participated in the survey. Participants were selected to ensure coverage of EMR developers, IT administrators, HMIS officers, health facility managers, and TM representatives involved in data reporting.

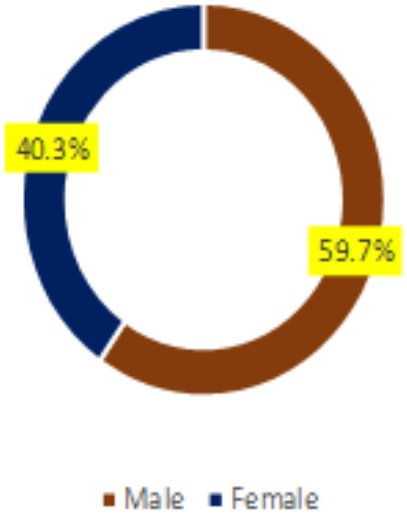


Figure. 1: Gender Distribution of Participants

A donut chart depicting gender distribution showed that the gender distribution among participants shows a moderate male dominance, with 59.7% male and 40.3% female respondents. This aligns with national trends in both conventional and traditional healthcare fields, where male professionals slightly outnumber females, especially in leadership and system development roles. However, the significant female representation also reflects inclusive sampling and the growing involvement of women in both health and traditional medicine practices.

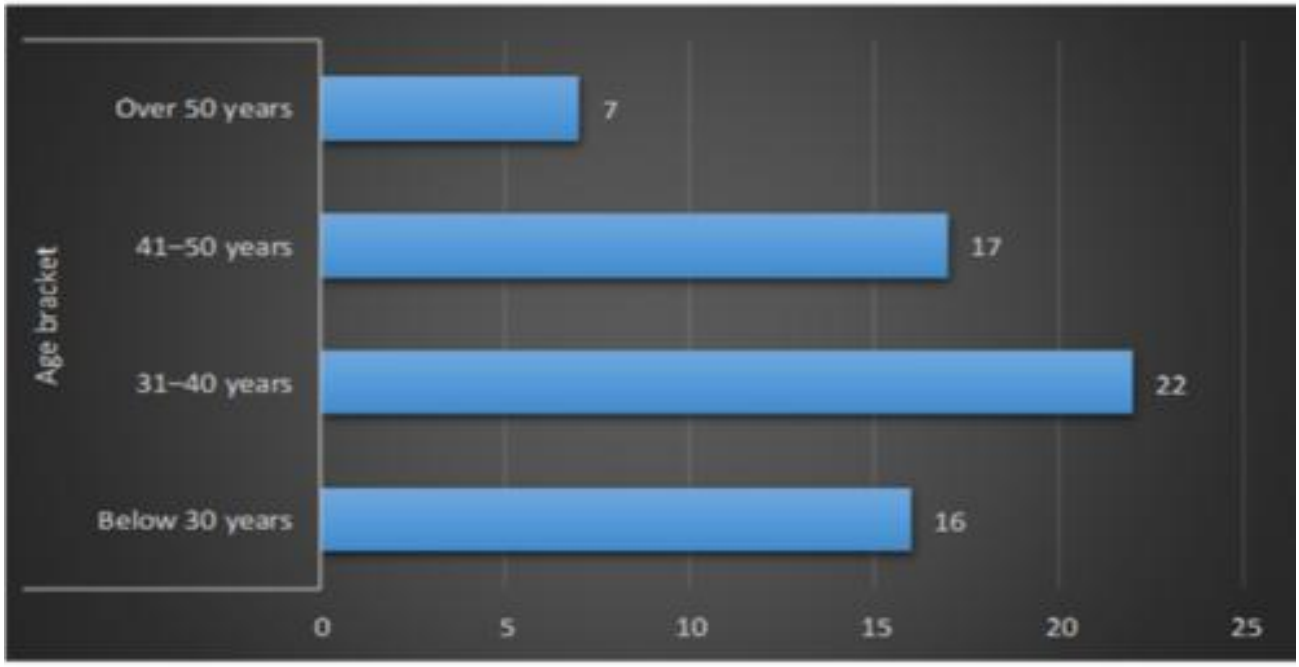


Figure. 2: Age Distribution of Participants

The 31–40 age group was the most represented (35.5%), followed by 41–50 years (27.4%). 25.8% were under 30, while 11.3% were above 50 years. This distribution indicates that most participants were mid-career professionals with substantial field experience. The age diversity also ensured varied perspectives from both seasoned professionals and younger, tech-savvy users of EMR systems. Importantly, the age spread supports robust reflections on both traditional and emerging healthcare practices.

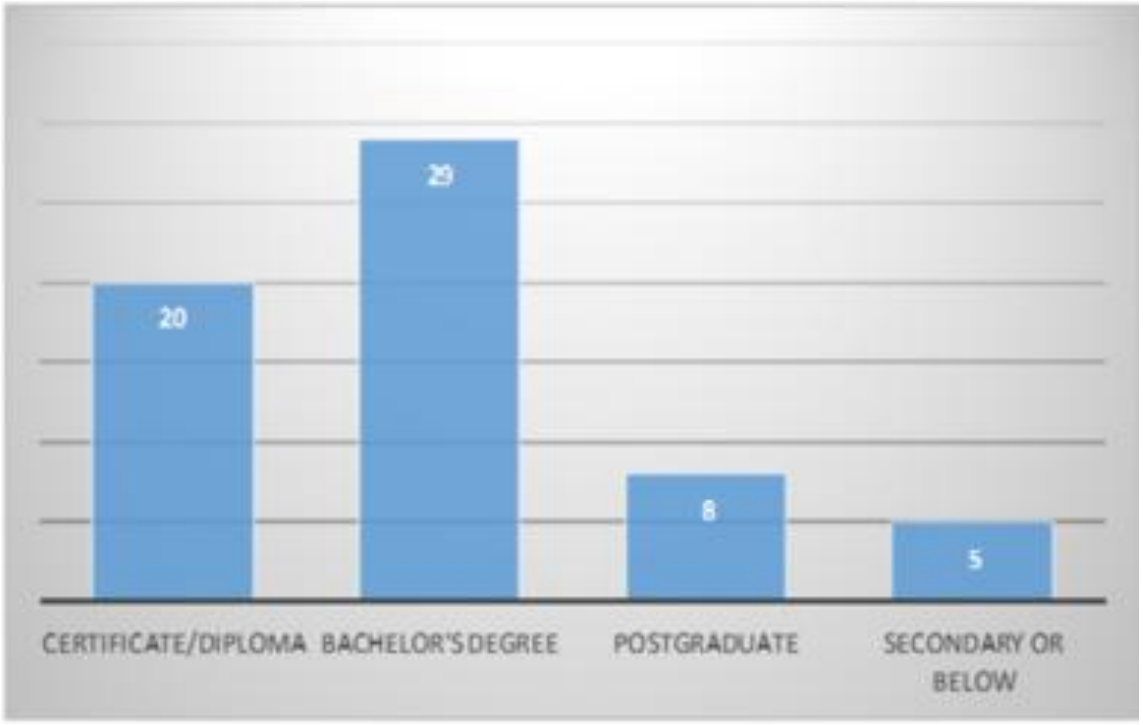


Figure. 3: Educational Attainment of Participants

Nearly half (46.8%) of the participants held bachelor's degrees, and 12.9% had postgraduate qualifications, indicating a highly educated respondent pool. A smaller portion (8.0%) had secondary education or below, predominantly among traditional healers. This educational spread reflects the interdisciplinary nature of the study and underscores the need to develop integration strategies that are accessible to all education levels, especially when designing user interfaces for TM practitioners with lower literacy levels.

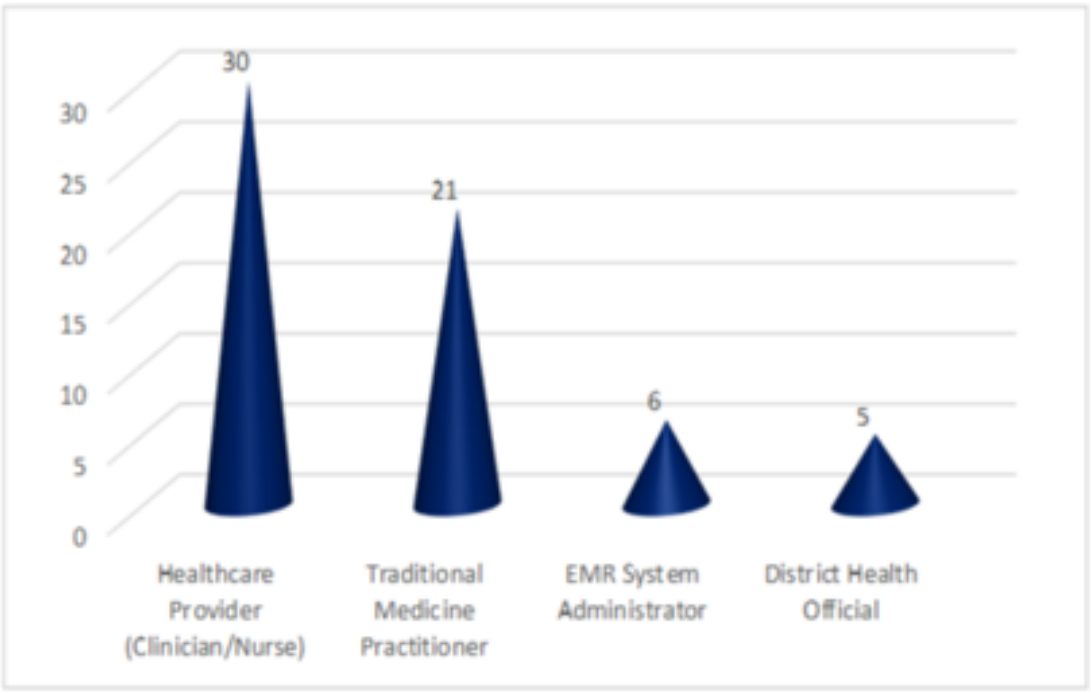


Figure 4: Roles of Respondents

Participants' roles included healthcare providers (48.4%), traditional medicine practitioners (33.9%), EMR administrators (9.7%), and district health officials (8.0%). This professional diversity provided multi-layered insights into TM data integration, from ground-level operations to system development and policy oversight. Including traditional medicine practitioners ensured that the framework addressed grassroots concerns and captured indigenous perspectives on data ownership and documentation practices.

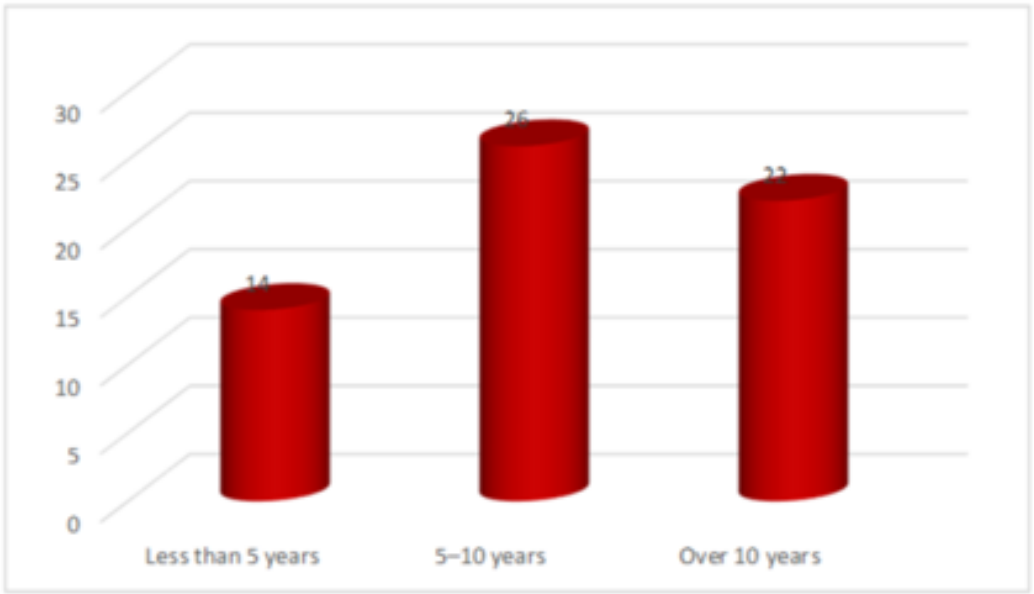


Figure 6.: Work Experience Distribution

Participants reported a broad range of professional experience, spanning from early-career (under 5 years) to veterans with over 15 years in service. This diversity contributed to balanced insights on both legacy issues (e.g., paper-based systems and data duplication) and future-oriented innovations (e.g., digitized HMIS tools). Respondents with longer work experience were particularly instrumental in identifying persistent structural barriers, while newer entrants provided a fresh perspective on usability and system responsiveness.

4.2 Barriers and Challenges to Integration of Traditional Medicine into HMIS

4.2.1 Overview of Identified Challenges

The integration of TM data into UgandaEMR faces multiple challenges spanning technical, institutional, socio-cultural, and infrastructural dimensions. Stakeholders identified five main categories of barriers:

1. Limited technical and human resource capacity
2. Socio-cultural resistance among practitioners and patients
3. Lack of standardized data tools and formats
4. Policy, governance, and institutional inadequacies
5. Infrastructure and resource constraints

These barriers correspond to the independent variables in the conceptual framework and demonstrate how technical, cultural, policy, and resource factors influence the integration process. Addressing these barriers fulfills Objective 1, which aimed to identify and analyze the key challenges to TM data integration.

These challenges directly map to the independent variables in the technical conceptual framework, demonstrating how technical, institutional, and cultural factors influence the integration process.

4.2.2 Limited Technical Capacity

A majority of respondents emphasized that limited technical capacity significantly hinders the adoption of TM modules within UgandaEMR. According to the survey, 33.9% of stakeholders strongly agreed and 40.3% agreed that insufficient technical expertise and system knowledge

is a key barrier, representing 74.2% total agreement. The mean score of 4.01 further underscores the convergence of stakeholder perceptions on this point.

This limitation manifests in several ways: health workers and traditional practitioners often lack formal training in digital data entry, system administrators are insufficiently equipped to support TM module customization, and there is a general shortage of IT staff familiar with both biomedical and TM workflows. Without addressing these gaps, any integration framework risks underutilization or erroneous data capture.

Implications: The proposed technical framework must incorporate training modules for TM practitioners and health facility staff, provide user-friendly interfaces, and offer modular system components that can be easily maintained by existing IT personnel. Capacity building should include digital literacy programs tailored to different user groups, ensuring both technical competence and sustainable adoption.

4.2.3 Socio-Cultural Resistance

Socio-cultural factors emerged as another major barrier, with 32.3% strongly agreeing and 38.7% agreeing (71% combined) that cultural perceptions impede TM data integration. The mean score of 3.92 reflects a strong, albeit slightly lower, consensus compared to technical barriers. Many TM practitioners perceive their knowledge as sacred or proprietary and are reluctant to digitize treatments for fear of intellectual property loss or cultural exploitation. Additionally, some communities exhibit mistrust towards formal health data systems, viewing them as external impositions rather than collaborative tools.

Implications: To overcome socio-cultural resistance, the integration framework must embed trust-building mechanisms, such as participatory co-design with TM practitioners, secure data anonymization, and clear guidelines on intellectual property rights. These strategies not only encourage adoption but also preserve the cultural integrity of traditional health practices.

4.2.4 Lack of Standard Tools and formats

Standardization of data collection tools was highlighted as a critical barrier, with 45.2% strongly agreeing and 35.5% agreeing (80.7% total) that inconsistent forms, terminologies, and reporting formats limit interoperability and data quality. The mean score of 4.15 indicates strong agreement that standardized tools are essential for reliable TM data integration.

The absence of standardized tools leads to fragmented and inconsistent documentation, making it difficult to harmonize TM data with existing biomedical datasets in UgandaEMR. Without structured data elements, the system cannot efficiently support reporting, analytics, or research.

Implications: The technical framework must define standardized data schemas, coding systems, and validation rules for TM information. Ensuring compatibility with UgandaEMR's existing data structures is essential for seamless integration. In addition, flexible templates should allow for future adaptation as new TM practices are incorporated.

4.2.5 Policy Governance Gap

The survey revealed that policy and governance gaps constitute the most pressing challenge. 50% of participants strongly agreed and 32.3% agreed that the lack of clear policies and regulatory guidance impedes TM data integration, totaling 82.3% agreement. This finding is supported by the highest mean score of 4.26, indicating near-universal stakeholder recognition of the problem.

Without national guidelines, TM practitioners and health facility staff are uncertain about their roles, reporting obligations, and data sharing protocols. Ambiguities in legal frameworks can result in inconsistent data capture, delayed adoption, and potential ethical violations.

Implications: The framework must be designed in alignment with national health policies, incorporating regulatory compliance modules and explicit protocols for data collection, validation, and sharing. Stakeholder training should include policy orientation to ensure clarity on responsibilities, reporting standards, and confidentiality.

4.2.6 Infrastructure and Resource Constraints

Infrastructure limitations were also widely reported, with 41.9% strongly agreeing and 33.9% agreeing (75.8% total) that inadequate electricity, internet connectivity, and device availability pose significant challenges. The mean score of 4.08 confirms broad agreement on the impact of infrastructural deficits on TM data integration.

Rural health facilities and TM practice centers frequently face intermittent power supply, low-bandwidth internet, and limited access to digital devices. Budgetary limitations exacerbate these challenges, restricting the ability to train personnel, deploy TM modules, and maintain system performance.

Implications: The technical framework should leverage offline-capable modules, low-bandwidth optimization, and mobile-based reporting tools. Resource allocation should prioritize scalable infrastructure investments and community-based digital literacy initiatives to ensure sustainable adoption.

Table :1. 1 Frequency Distribution of Perceived Barriers to Traditional Medicine Data Integration (N=62)

No.	Barrier Category/Assertion	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	Limited technical capacity	33.9%	40.3%	9.7%	11.3%	4.8%
2	Socio-cultural resistance	32.3%	38.7%	12.9%	9.7%	6.4%
3	Lack of standard tools	45.2%	35.5%	8.1%	6.5%	4.8%
4	Policy and governance gaps	50.0%	32.3%	6.5%	6.5%	4.8%
5	Infrastructure constraints	41.9%	33.9%	8.1%	9.7%	6.4%

Table 2. 1 Descriptive Statistics of Perceived Barriers to Integrating TM Data into Uganda's HMIS

No.	Barrier Category / Statement	Mean	Std. Deviation	N
1	Limited technical capacity	4.01	0.93	62
2	Socio-cultural beliefs	3.92	0.98	62
3	Lack of standard data tools	4.15	0.81	62
4	Absence of clear policies	4.26	0.78	62
5	Inadequate infrastructure	4.08	0.85	62

The descriptive statistics affirm the consensus among respondents. The highest mean score (4.26) was attributed to policy and governance gaps, confirming that the absence of a regulatory framework is the most pressing barrier. Other categories also showed high levels of agreement, reflected in mean scores above 4.0 and low standard deviation values, indicating strong convergence in stakeholder perceptions.

4.3 Stakeholder Readiness and Perceptions

Understanding stakeholder readiness and perceptions is crucial for the successful integration of Traditional Medicine (TM) into Uganda's electronic health records system, particularly UgandaEMR. This section addresses Objective 2 of the study: assessing stakeholder preparedness and attitudes toward TM data integration. Insights were obtained from 62 stakeholders across health facility staff, district health officials, EMR administrators, and traditional medicine practitioners. Four key dimensions were examined: perceived usefulness of TM data, awareness of HMIS standards and tools, willingness to use reporting tools, and access to training and capacity building.

4.3 Design an integration framework for TM data within HMIS, taking into account stakeholder perceptions, system requirements, and opportunities for capacity building.

This section addresses Objective 2: Design a practical integration framework for TM data

within HMIS, considering stakeholder perceptions, system requirements, and opportunities for capacity building. The framework was informed by 62 stakeholders, including health facility staff, district health officials, EMR administrators, and TM practitioners. The design process focused on four key dimensions:

1. Perceived usefulness of TM data
2. Awareness of HMIS standards and tools
3. Willingness to use reporting tools
4. Access to training and capacity building

These variables were used to shape the technical, institutional, and human/cultural components of the TM-inclusive UgandaEMR module.

4.3.1 Perceived Usefulness of TM Data

A majority of stakeholders recognized the value of incorporating TM data into national health systems. Survey results indicate that 38.7% strongly agreed and 43.5% agreed that TM data is essential for health planning and policy decision-making, totaling 82.2% agreement. This high level of perceived usefulness reflects an emerging recognition that TM is not only a complementary health practice but also a source of critical epidemiological and service delivery information, particularly in rural and underserved areas where TM practitioners are often the first point of care.

Implications: The perceived utility of TM data suggests that integration efforts are likely to be welcomed if accompanied by appropriate technical support and training. Incorporating TM data into UgandaEMR can enhance evidence-based decision-making, health service planning, and resource allocation, contributing to a more holistic and inclusive national health information system.

4.3.2 Awareness of HMIS Standards and Tools

Awareness of existing HMIS standards and UgandaEMR functionalities was uneven among stakeholders. While 33.9% strongly agreed and 40.3% agreed that they were aware of these standards, 11.3% were not sure, and the remainder disagreed. Awareness was highest among formal health facility staff and district officials but lower among TM practitioners operating outside conventional health facilities. The mean score of 3.92 indicates moderate but not universal familiarity with HMIS tools.

Implications: The disparity in awareness highlights the need for targeted capacity-building initiatives for TM practitioners, including orientation sessions, simplified user manuals, and mentorship programs. Without sufficient knowledge of HMIS standards, practitioners may underreport or incorrectly document TM data, undermining integration efforts and the reliability of the national dataset.

4.3.3 Willingness to Use Reporting Tools

Stakeholders demonstrated strong willingness to adopt TM data reporting tools. Survey findings show that 41.9% strongly agreed and 37.1% agreed that they would use reporting tools if provided with adequate training, totaling 79% agreement. Participants emphasized preferences for mobile-compatible platforms, simplified user interfaces, and local language support.

Implications: The expressed willingness indicates that resistance is primarily rooted in capacity gaps rather than reluctance. Consequently, the technical framework should incorporate user-centered design, allowing stakeholders to engage easily with the system. Mobile-based solutions with offline capabilities, automated data validation, and local-language support can facilitate uptake, especially among practitioners in remote areas.

4.3.4 Access to Training and Capacity Building

Only 64.5% of the Only 29% strongly agreed and 35.5% agreed that they had received prior training in HMIS or data management, representing 64.5% total. TM practitioners were the least trained group, revealing a critical gap in technical readiness. The mean score of 3.72 highlights moderate preparedness but indicates that a significant proportion of stakeholders remain untrained.

Implications: Capacity-building is essential to ensure standardized data capture and integration. The framework should embed tiered training programs, ranging from basic digital literacy for TM practitioners to advanced system administration for EMR staff. This structured approach will enhance data quality, reduce errors, and promote confidence in using the integrated TM modules.

Table:3. 1. Frequency Distribution of Stakeholder Perceptions and Readiness to Integrate TM Data (N = 62)

No.	Statement	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	TM data is useful for planning and policy decisions	24 (38.7%)	27 (43.5%)	5 (8.1%)	4 (6.5%)	2 (3.2%)
2	I am aware of existing HMIS standards and tools	21 (33.9%)	25 (40.3%)	7 (11.3%)	6 (9.7%)	3 (4.8%)
3	I am willing to use data reporting tools if trained	26 (41.9%)	23 (37.1%)	5 (8.1%)	5 (8.1%)	3 (4.8%)
4	I have received training in data management or HMIS	18 (29.0%)	22 (35.5%)	8 (12.9%)	9 (14.5%)	5 (8.1%)

Source: Primary data

4.4 Stakeholder Engagement for Framework Validation

This section addresses Objective 3: Validate the proposed integration framework through stakeholder engagement, focusing on system adaptability, cost-effectiveness, institutional and political support, and inclusion of TM practitioners in policy development.

Engagement involved 62 stakeholders including health facility staff, district health officials, EMR administrators, and TM practitioners. The validation exercise focused on **four key dimensions**, which correspond directly to the independent and mediating variables in the conceptual framework:

1. System adaptability
2. Cost-effectiveness of integration strategies
3. Institutional and political support
4. Inclusion of TM practitioners in policy development

4.4.1 Perceived Adaptability of UgandaEMR to Accommodate TM Data

A majority of respondents (67.7%) perceived the UgandaEMR system as adaptable enough to host TM data modules. Stakeholders highlighted the modular architecture of the system, which allows the addition of extensions or plug-ins without disrupting existing biomedical workflows. Participants indicated that TM data could be captured through dedicated modules for herbal treatments, patient narratives, and traditional diagnostic procedures, all interoperable with the core EMR system.

This perception is significant because technical feasibility underpins the integration process, the mediating variable in the conceptual framework. Without adaptable system architecture, even highly motivated stakeholders and clear policies would not result in effective TM data inclusion. Respondents with longer experience in system administration emphasized that proper configuration and standardized templates could overcome initial complexity, ensuring scalability across health facilities.

4.4.2 Cost-Effectiveness of the Proposed integration Strategies

Approximately 67.8% of participants agreed that the proposed strategies for integrating TM data are cost-effective. These strategies include leveraging existing mobile and network infrastructure, utilizing open-source tools like KoboToolbox for data collection, and

decentralizing training to local communities. Stakeholders noted that while upfront costs for hardware, training, and software customization exist, these are offset by long-term benefits, such as improved surveillance, enhanced patient outcomes, and comprehensive health reporting.

From a technical perspective, cost-effectiveness is crucial to system sustainability. The framework is designed to minimize redundancy by using existing digital health platforms and ensuring that TM data collection integrates seamlessly into ongoing HMIS workflows. This alignment with infrastructure and software readiness, highlighted in the conceptual framework, strengthens the argument for pragmatic implementation.

4.4.3 Institutional and Political Support

About 62.9% of respondents indicated that sufficient institutional and political support exists to facilitate TM data integration, citing the Ministry of Health's ongoing digital health initiatives and interest in broader health data coverage. Nonetheless, 21% of participants expressed uncertainty or disagreement, reflecting gaps in policy awareness and engagement at some administrative levels.

These findings underscore the importance of institutional readiness, as outlined in the conceptual framework's independent variables. Technical integration alone is insufficient if policies, governance, and leadership commitment do not support adoption. Stakeholders suggested formalizing TM data inclusion policies, establishing clear guidelines for data management, and promoting interdepartmental coordination to reinforce the institutional foundation of the framework.

4.4.4 Inclusion of TM Practitioners in Policy Development

Stakeholder feedback revealed that only 56.5% agreed that TM practitioners are adequately included in policy formulation processes. Many traditional healers reported feeling sidelined, with limited opportunities to shape decisions on how their knowledge is documented and integrated into the national HMIS.

This gap has direct implications for the human and cultural factors identified in the conceptual framework. Active participation of TM practitioners is essential to ensure culturally appropriate data capture, enhance trust in digital systems, and promote adoption. The proposed framework therefore recommends the establishment of consultative platforms, such as TM

councils or forums, to engage practitioners continuously throughout the integration process.

4.4.5 Implications for Framework Design

The stakeholder engagement exercise provided critical insights for refining the TM integration framework:

1. **Technical Modularity:** EMR modules must support diverse TM data formats, standardized templates, and interoperable structures.
2. **Capacity Building:** Training programs tailored to both TM practitioners and health facility staff are necessary to ensure consistent and accurate data entry.
3. **Policy Reinforcement:** National guidelines should explicitly address TM data inclusion, ownership, and privacy to strengthen institutional legitimacy.
4. **Participatory Governance:** TM practitioners must be included in policy and technical discussions to foster trust and cultural appropriateness.
5. **Cost-Efficiency:** Integration strategies should leverage existing infrastructure and open-source tools to reduce implementation and maintenance costs.

These insights confirm that the framework is technically viable, contextually relevant, and aligned with both system capabilities and stakeholder expectations.

Table:4. 1 Perceptions on Strategies and Policy Recommendations for TM Data Integration

No.	Statement	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	Current EMR system is adaptable to include TM data	18 (29.0%)	24 (38.7%)	9 (14.5%)	7 (11.3%)	4 (6.5%)
2	Proposed integration methods are cost-effective	20 (32.3%)	22 (35.5%)	8 (12.9%)	7 (11.3%)	5 (8.0%)
3	There is strong political and institutional support for integration	16 (25.8%)	23 (37.1%)	10 (16.1%)	8 (12.9%)	5 (8.1%)

4	TM practitioners are included in policy development	14 (22.6%)	21 (33.9%)	12 (19.4%)	9 (14.5%)	6 (9.6%)

Source: Primary data

4.5 Summary of Key Findings Aligned to Research Objectives

This section synthesizes the key findings from the study, ensuring alignment with the research objectives and the conceptual framework that guided the development of a technical TM-inclusive EMR model.

Objective 1: Key Barriers to Integration of Traditional Medicine Data

The study identified five major categories of barriers that affect the integration of TM data into Uganda's HMIS:

1. **Limited Technical Capacity:** Many health workers and TM practitioners lack sufficient digital literacy and technical expertise. The UgandaEMR system, while adaptable, requires additional training for stakeholders to capture and manage TM data effectively. Stakeholders reported that absence of dedicated TM modules further complicates integration, echoing the findings in Table 1 (Mean = 4.01, SD = 0.93).
2. **Socio-Cultural Resistance:** TM practitioners often perceive their knowledge as sacred or confidential. Fear of cultural exploitation and mistrust in government systems inhibits documentation. This barrier (Mean = 3.92, SD = 0.98) highlights the need for culturally sensitive strategies within the technical framework.
3. **Lack of Standard Data Tools:** The absence of unified data collection templates and terminologies for TM data contributes to fragmentation and poor interoperability (Mean = 4.15, SD = 0.81). The study emphasizes that standardized tools are critical for both accurate data capture and system scalability.
4. **Policy and Governance Gaps:** Respondents consistently identified the absence of clear policies or regulatory guidance as the most pressing barrier (Mean = 4.26, SD = 0.78). Without a national framework defining roles, responsibilities, and data sharing protocols, integration remains ad hoc and limited.
5. **Infrastructure Constraints:** Limited access to electricity, internet connectivity, and

digital devices in rural and semi-urban areas constrains TM data entry and reporting (Mean = 4.08, SD = 0.85). These infrastructural gaps underscore the importance of technical readiness as a key component of the conceptual model.

Collectively, these findings indicate that successful integration requires addressing technical, institutional, and cultural factors in tandem, consistent with the study's conceptual framework.

Objective 2: Objective 2: Designing TM data into HMIS in a way that addresses the identified barriers and strengthens stakeholder capacity and participation

Stakeholder perceptions revealed significant enablers for TM data integration:

- **Adaptability of UgandaEMR:** Two-thirds of participants (67.7%) perceived the EMR as technically capable of hosting TM data through modular add-ons, demonstrating system flexibility to accommodate non-conventional health data.
- **Cost-Effective Strategies:** Integration strategies leveraging open-source platforms, mobile infrastructure, and decentralized training were perceived as economically viable (67.8% agreement), supporting sustainability of implementation.
- **Institutional Support:** A majority (62.9%) acknowledged existing political and institutional commitment for digital health initiatives, although gaps remain in policy awareness and TM practitioner inclusion.
- **Willingness and Capacity:** Most stakeholders expressed willingness to adopt TM data reporting tools if provided with adequate training (79%). However, only 64.5% had received prior HMIS or data management training, emphasizing the need for targeted capacity-building initiatives.

These enablers demonstrate that the system has both technical and human readiness for integration, provided the framework addresses capacity and policy gaps, aligning directly with the mediating variable "Integration Process" in the conceptual framework.

Objective 3: Validation of the Proposed TM Integration Framework

Stakeholder engagement validated key components of the proposed technical framework:

1. **Modular Integration:** TM data can be incorporated via flexible modules without disrupting core EMR functions, supporting scalable implementation.
2. **Participatory Policy Development:** Inclusion of TM practitioners in consultative

mechanisms is essential to ensure culturally appropriate data capture and trust in the system.

3. **Training and Capacity-Building:** Tailored digital literacy programs are critical for consistent and accurate TM data entry.
4. **Sustainability Considerations:** Leveraging existing infrastructure and open-source tools ensures cost-effectiveness, long-term viability, and ease of maintenance.
5. **Evidence-Based Decision-Making:** Integrated TM data enriches national health information, enabling comprehensive planning, equitable access, and improved public health outcomes.

Overall, stakeholder feedback confirmed that the proposed framework is both technically feasible and contextually relevant, aligning the study outcomes with the original objectives and the conceptual model, which emphasizes the interplay of technical, institutional, and cultural factors in achieving successful TM-inclusive EMR adoption.

CHAPTER 5
FRAMEWORK FOR INTEGRATING TRADITIONAL MEDICINE DATA INTO UGANDA'S NATIONAL HEALTH CARE SYSTEM

5.0 Introduction

Integrating traditional medicine (TM) data into Uganda's Health Management Information System (HMIS) demands a comprehensive, context-sensitive framework that addresses the complex interplay of technical, organizational, and human factors. This framework seeks to identify and overcome barriers to integration, design a scalable, interoperable system aligned with existing national HMIS policies, and validate the framework through inclusive stakeholder engagement and feasibility testing. The framework is structured into four essential layers: strategic governance and planning; system assessment and development; deployment and operationalization; and change management.

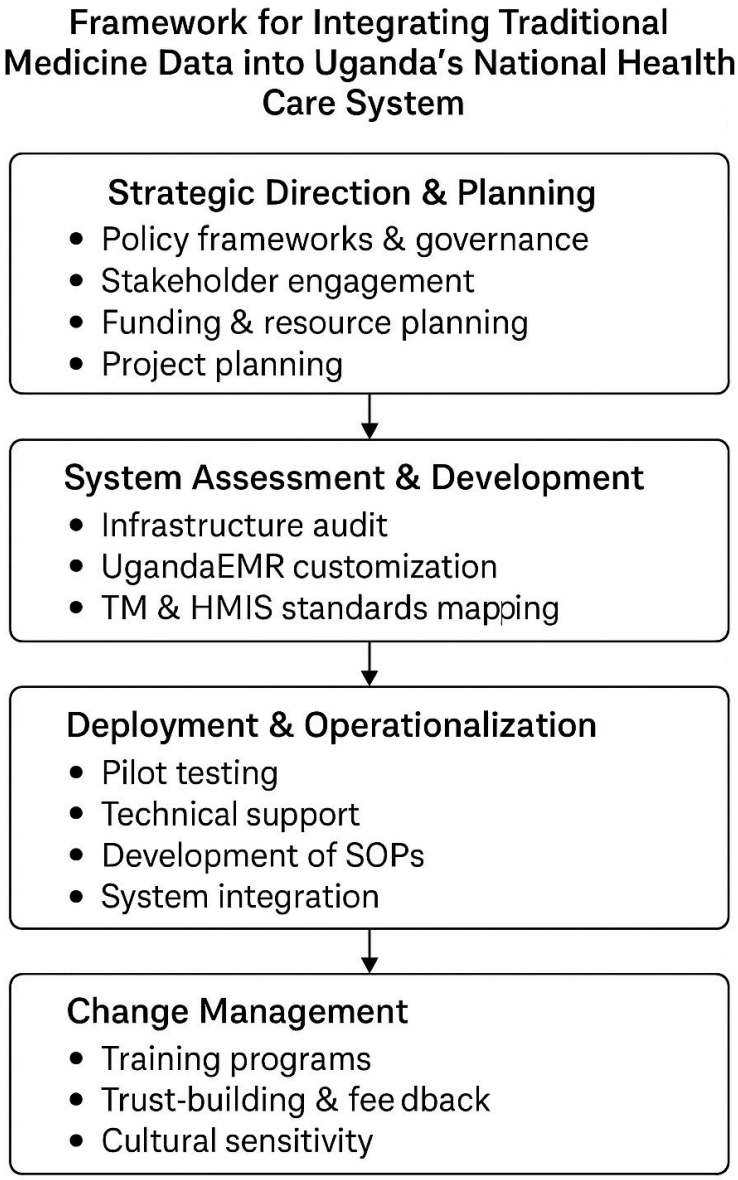


Fig 8: proposed framework for integration of traditional medicine into Uganda's national healthcare system

5.1 Strategic Direction and Planning

Establishing a clear strategic direction is fundamental to guiding the integration of TM data into Uganda's national healthcare system. This phase involves setting a vision that aligns with national health goals, defining measurable objectives, allocating resources efficiently, and coordinating the activities of diverse stakeholders. Effective strategic planning ensures regulatory compliance, promotes interoperability with existing HMIS platforms, and addresses the diverse needs of conventional healthcare providers, traditional practitioners, policymakers,

and patients. Additionally, it incorporates a governance structure that defines authority, responsibility, and accountability to maintain data security and quality. Without strategic clarity, integration efforts risk fragmentation, resource wastage, and stakeholder disengagement.

> "A well-articulated strategic plan is a cornerstone for health system integration, enabling organizations to navigate complex regulatory landscapes and harmonize competing interests to achieve shared goals." (Nguyen et al., 2019).

5.1.1 Governance and Authority

Governance structures formalize the rules, policies, and procedures necessary to oversee the design, implementation, and operation of the TM data integration system. This includes compliance with Uganda's Data Protection and Privacy Act, adherence to international standards such as HL7 and FHIR, and clear delineation of roles among healthcare providers, TM practitioners, IT specialists, and administrators. Governance mechanisms such as regular audits, compliance checks, and incident reporting frameworks reinforce system integrity and user trust. Proper authority ensures that decisions are made transparently and that data management follows ethical and legal standards, which is vital given the sensitive nature of health data and the cultural diversity surrounding TM practices.

> "Governance provides the necessary oversight and control mechanisms that safeguard patient data while ensuring interoperability standards are met, thus fostering trust among stakeholders." (Kaplan, 2021).

5.1.2 Stakeholder Engagement

Successful integration requires identifying and engaging all relevant stakeholders early and continuously. This group includes Ministry of Health officials, healthcare providers, TM practitioners, IT personnel, patients, and policymakers. Engagement strategies should be tailored to address the unique concerns and capacities of each group, incorporating participatory planning, regular consultations, and transparent communication. Such collaboration builds trust, facilitates consensus-building, and ensures that the system responds effectively to user needs and cultural sensitivities. Stakeholder feedback mechanisms also help identify potential barriers and enable iterative adjustments to the framework, thus enhancing sustainability.

> "Early and sustained stakeholder engagement fosters ownership and mitigates resistance, ensuring that health information systems are not only technically sound but also socially acceptable." (Bryson, 2018).

5.1.3 Funding and Resource Planning

Robust financial planning underpins the entire integration process. It involves securing diverse funding sources, including government allocations, donor grants, and private sector contributions. Transparent budgeting and financial management practices help track expenditures and ensure accountability. Equally important is planning for long-term sustainability, encompassing future upgrades, training, and system maintenance. Resource planning must also address human capacity by allocating skilled personnel for technical support, training, and continuous system evaluation. Without sustained funding and resource allocation, integration efforts risk premature failure or underperformance.

> "Financial sustainability in health information system projects is critical; without it, initial successes often erode as systems become outdated and users lose confidence." (Smith, 2021).

5.1.4 Project Planning

A detailed project plan establishes clear integration objectives, scope, timelines, milestones, and risk management strategies. It defines deliverables and responsibilities, preventing scope creep and ensuring coordinated efforts among multidisciplinary teams. Effective planning also involves identifying potential risks technical, financial, or organizational and outlining mitigation strategies. Continuous monitoring and evaluation within the project framework enable timely identification of challenges and allow for adaptive management. This structured approach promotes transparency and accountability, leading to more predictable and successful integration outcomes.

> "Comprehensive project planning that includes risk management and monitoring mechanisms is essential to navigate the complexities of health system integration." (Kerzner, 2019).

5.5 Conclusion

The integration of traditional medicine data into Uganda's national healthcare system is a complex, multifaceted endeavor that requires deliberate planning, strong governance, and inclusive stakeholder collaboration. This framework emphasizes the necessity of addressing legal and technical standards, infrastructural readiness, and user-centered design to ensure data accuracy, privacy, and usability. Deployment hinges on robust core and ancillary system integration supported by secure data management and standardized operational procedures. Critical to success is effective change management, including active end-user engagement, comprehensive training, and continuous validation. Through these coordinated efforts, Uganda can harness the potential of TM data to enrich healthcare delivery and evidence-based decision-making, ultimately advancing health outcomes and system resilience.

CHAPTER SIX
Summary, Conclusions, and Recommendations

6.0 Introduction

This chapter presents a synthesis of the major findings of the study on integrating Traditional Medicine (TM) data into Uganda's Health Management Information System (HMIS) via UgandaEMR. The discussion is organized around the three research objectives: (1) identifying and analyzing the barriers hindering TM data integration; (2) designing a comprehensive, context-sensitive integration framework; and (3) validating the proposed framework through stakeholder engagement and assessing its feasibility. This chapter further provides evidence-based conclusions, policy and technical recommendations, and suggestions for further research to strengthen the integration of TM into Uganda's health information ecosystem.

6.1 Summary of Key Findings

6.1.1 Objective 1: Barriers Hindering TM Data Integration

The study identified five major categories of barriers affecting TM integration, consistent with both stakeholder perceptions and the conceptual framework:

1. Policy and governance gaps:
    - The lack of a clear national regulatory framework emerged as the most critical barrier, with a mean score of 4.26.
    - Stakeholders highlighted the absence of explicit guidelines defining TM practitioners' roles, reporting obligations, and data-sharing protocols.
    - Policy ambiguity creates confusion and discourages TM practitioners from participating in data reporting. This finding aligns with prior literature (Uganda MoH, 2021; Kiwanuka, 2021) which emphasizes that legal and institutional clarity is essential for successful health data integration.
2. Lack of standardized data tools and formats**:**
    - Inconsistent data collection templates, terminologies, and reporting formats result in fragmented documentation and poor interoperability (Mean = 4.15).
    - TM data, often narrative and qualitative in nature, does not easily align with structured HMIS datasets.

- Standardized templates and ontologies are therefore critical to harmonize TM data with biomedical datasets and support analytics and policy-making.

3. Infrastructure constraints**:**
    - Limited access to electricity, low-bandwidth internet, and scarce digital devices impede effective TM data entry, particularly in rural or semi-urban areas (Mean = 4.08).
    - Budgetary limitations further restrict infrastructure improvements, creating challenges for system maintenance and scalability.
4. Limited technical capacity:
    - Many health workers and TM practitioners lack digital literacy and skills for system navigation, module customization, and data entry (Mean = 4.01).
    - UgandaEMR, although technically flexible, requires specialized configuration for TM-specific workflows. Without capacity-building, stakeholders risk underutilizing or incorrectly populating TM modules.
5. Socio-cultural resistance:
    - TM knowledge is often regarded as sacred, proprietary, or spiritually significant, leading to hesitancy in digitizing data (Mean = 3.92).
    - Communities and biomedical practitioners sometimes mistrust digital systems, perceiving them as externally imposed, which hinders collaboration.

Collectively, these findings indicate that successful integration requires addressing technical, institutional, and cultural factors simultaneously, confirming the relevance of the conceptual framework developed for this study.

6.1.2 Objective 2: Designing an Integration Framework for TM Data within HMIS

Stakeholder perceptions revealed several enablers that support TM data integration:

1. **Adaptability of UgandaEMR:**
    - Two-thirds of respondents (67.7%) perceived the system as modular and technically capable of hosting TM data, suggesting that scalable integration is feasible.
    - Dedicated modules for herbal treatments, traditional diagnostics, and patient narratives could be implemented without disrupting existing biomedical workflows.

2. **Cost-effectiveness of integration strategies:**
    - Approximately 67.8% of participants agreed that leveraging open-source platforms, mobile-based tools, and decentralized training would reduce implementation costs.
    - Utilizing existing infrastructure minimizes duplication and ensures long-term sustainability.
3. **Institutional support:**
    - Moderate political and institutional commitment (62.9%) exists for digital health initiatives, indicating a favorable environment for TM data integration.
    - Nonetheless, gaps remain in policy awareness and in the inclusion of TM practitioners in decision-making processes.
4. **Willingness and capacity for adoption:**
    - Most stakeholders (79%) expressed readiness to use TM data reporting tools if provided with training.
    - However, only 64.5% had prior HMIS or data management training, highlighting the need for targeted capacity-building interventions.

These findings indicate that the technical and human resources exist to support TM integration, provided the framework addresses training, policy gaps, and participatory governance.

6.1.3 Objective 3: Validation of the Proposed TM Integration Framework

Stakeholder engagement confirmed the framework's relevance and practicality:

1. **Modular integration:**
    - UgandaEMR can support TM data via flexible modules, ensuring that system scalability and interoperability are maintained.
2. **Participatory policy development:**
    - Only 56.5% of stakeholders believed TM practitioners are currently involved in policy formulation, underscoring the need for inclusive governance mechanisms such as TM councils or consultative forums.
3. **Training and capacity-building:**
    - Stakeholders emphasized the importance of tailored digital literacy programs to ensure accurate, consistent data entry across health facilities and TM practice centers.

4. **Sustainability considerations:**
    - Use of mobile platforms, offline-capable tools, and open-source software enhances cost-effectiveness and long-term maintainability.
5. **Evidence-based decision-making:**
    - Integration of TM data enriches HMIS datasets, improving planning, service delivery, and health outcomes, particularly in rural areas where TM is a primary source of care.

Overall, validation highlighted that the framework is technically feasible, contextually appropriate, and aligned with both stakeholder expectations and the broader conceptual model emphasizing technical, institutional, and socio-cultural determinants of integration.

6.2 Conclusions

The study concludes that:

1. **Integration of TM into HMIS is necessary and achievable.**
    - TM data contributes valuable epidemiological and service delivery information, complementing conventional health data.
2. **Barriers are surmountable through structured interventions.**
    - Technical, institutional, and socio-cultural challenges require a multi-faceted approach combining system design, policy alignment, capacity-building, and stakeholder engagement.
3. **The proposed four-layered framework is both feasible and relevant.**
    - Strategic planning, system development, deployment, and change management collectively provide a roadmap for successful TM data integration.
4. **Implementation requires more than technical readiness.**
    - Political will, inclusive policy-making, cultural sensitivity, and sustainable investment are critical for adoption.

The study emphasizes that TM integration is as much a socio-institutional reform as it is a technical intervention, acknowledging the cultural, historical, and community significance of traditional healing practices.

6.3 Recommendations

1. **Policy and governance:**
    - Establish a national regulatory framework formally recognizing TM as part of the health system, with clear roles, reporting obligations, and data privacy protocols.
2. **Standardized data tools:**
    - Develop TM-specific forms, coding systems, and templates compatible with UgandaEMR and DHIS2 to ensure interoperability and consistent data capture.
3. **Capacity-building initiatives:**
    - Implement digital literacy and HMIS training programs tailored for TM practitioners, health facility staff, and EMR administrators.
4. **Phased pilot testing:**
    - Roll out the integration framework in selected districts to evaluate technical feasibility, workflow adaptation, and scalability.
5. **Inclusive stakeholder participation:**
    - Institutionalize consultative mechanisms engaging TM councils, policymakers, and biomedical professionals in continuous system design and policy formulation.
6. **Infrastructure and resource allocation:**
    - Invest in electricity, network connectivity, digital devices, and maintenance support to enable reliable TM data entry and reporting.
7. **Monitoring and evaluation:**
    - Establish systems to track data quality, user adoption, and integration outcomes, informing iterative improvements and scaling strategies.

6.4 Suggestions for Further Research

1. **Pilot and evaluate the framework in real-world settings.**
2. **Assess the usability, data completeness, and long-term impact of TM data integration on health outcomes.**
3. **Conduct legal and ethical analyses on TM data ownership, privacy, and intellectual property rights.**
4. **Evaluate the economic feasibility of TM integration versus parallel or paper-based systems.**

5. **Develop standardized indicators and classification systems for TM suitable for national health statistics.**
6. **Explore low-cost, AI-powered, and mobile data collection tools for low-literacy and rural TM practitioners.**
7. **Encourage collaboration with NGOs, clinical trial networks, and donors to support implementation and evaluation.**

By addressing these areas, Uganda can establish a robust, culturally sensitive, and inclusive health information system that leverages the full spectrum of care practices in the country.

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APPENDICES

Appendix A: Semi-Structured Interview Guide

Title:

Key Informant Interview Guide on the Integration of Traditional Medicine (TM) Data into UgandaEMR

Target Respondents:

- Ministry of Health policymakers
- UgandaEMR developers and administrators
- District health information officers
- Traditional medicine association representatives
- Health facility workers
- Patients who have received TM services

Introduction to Respondent:

Thank you for agreeing to participate in this interview. The purpose of this discussion is to explore your views, experiences, and insights on the integration of traditional medicine data into Uganda's electronic health information systems, particularly UgandaEMR. Your responses will be treated with the highest confidentiality and used solely for academic research. With your consent, this interview may be recorded to aid transcription and analysis.

Section A: Background Information

1. What is your current role in the healthcare sector?
   .....
   .....
2. How long have you been involved in health service delivery, data management, or policy-making?
   .....
   .....

Section B: Current Systems and Practices

3. What is your experience with UgandaEMR or any other electronic health information system in your work or health facility?

   .....

   .....

4. Are there any current systems or practices in place to record and manage data from traditional medicine services?

   .....

   .....

Section C: Barriers and Opportunities

5. What challenges do you foresee in integrating traditional medicine data into UgandaEMR?

   .....

   .....

6. Are there technical, cultural, or organizational barriers that may affect this integration process?

   .....

   .....

Section D: Readiness and Support

7. In your opinion, how ready are traditional medicine practitioners and health workers to adopt digital reporting tools?

   .....

   .....

8. What forms of support (training, tools, awareness, etc.) would help facilitate the integration of TM data?

   .....

   .....

Section E: Framework Features and Sustainability

9. What core features or components should be considered in the framework to enable successful integration of TM into UgandaEMR?

   .....

   .....

10. How do you think sustainability and user adoption can be ensured in the long term?

    .....

    .....

Closing Section

11. Do you have any additional suggestions or concerns regarding the inclusion of TM data into Uganda's health information system?

    .....

    .....

Appendix B: Structured Survey Questionnaire

Title:

Survey on Barriers, Readiness, and Feasibility of Integrating Traditional Medicine (TM) Data into UgandaEMR

Instructions:

Please answer all questions truthfully. All data collected will be anonymized and used for research purposes only. Tick where appropriate or write your responses in the spaces provided.

Section A: Background Information

1. Age Group

   ☐ Under 30 ☐ 31–40 ☐ 41–50 ☐ Over 50

2. Gender

   ☐ Male ☐ Female ☐ Prefer not to say

3. Primary Role

   ☐ Health Facility Worker

   ☐ District Health Information Officer

   ☐ UgandaEMR Developer/Admin

   ☐ Traditional Medicine Practitioner

   ☐ Ministry of Health Policy Official

   ☐ Patient/Community Member

4. Highest Educational Qualification

   ☐ Secondary or Below

   ☐ Certificate or Diploma

   ☐ Bachelor's Degree

   ☐ Postgraduate Degree

5. Years of Professional or User Experience in Health Services

   ☐ Less than 3 years

   ☐ 3–5 years

   ☐ 6–10 years

   ☐ More than 10 years

Section B: Knowledge and Experience with Systems

6. Have you used or interacted with UgandaEMR in any capacity?

   ☐ Yes ☐ No ☐ Not Sure

7. Are you aware of any initiatives to include TM in Uganda's HMIS or EMR systems?

   ☐ Yes ☐ No

8. How frequently do you interact (professionally or as a patient) with traditional medicine services?

   ☐ Never ☐ Rarely ☐ Occasionally ☐ Frequently

Section C: Perceived Barriers (Rate from 1–5)

Please indicate your level of agreement with the following statements: **(1 = Strongly Disagree, 5 = Strongly Agree)**

Statement	1	2	3	4	5
TM practitioners lack digital skills to use electronic systems.	☐	☐	☐	☐	☐
There is insufficient policy support to enable TM data integration.	☐	☐	☐	☐	☐
Cultural beliefs affect willingness to share patient data.	☐	☐	☐	☐	☐
TM data is often recorded manually and not standardized.	☐	☐	☐	☐	☐
UgandaEMR does not currently support fields or modules for TM data.	☐	☐	☐	☐	☐
Patients are concerned about privacy when traditional health data is digitized.	☐	☐	☐	☐	☐
Healthcare workers lack training on TM data reporting standards.	☐	☐	☐	☐	☐

Section D: Readiness and Support Needs

9. What kind of support would best facilitate the integration of TM data? *(Tick all that apply)*

   ☐ Technical training for TM practitioners

☐ UgandaEMR customization to include TM modules

☐ Clear MoH guidelines and policies

☐ Awareness campaigns and community sensitization

☐ Workshops and user forums

☐ Mobile-based or offline-capable EMR systems

☐ Feedback and reporting mechanisms for TM patients

Section E: Open-Ended Questions

10. In your view, what is the biggest barrier to integrating traditional medicine data into UgandaEMR?

    .....

    .....

11. What would be your top recommendation for overcoming that barrier?

    .....

    .....

12. How do you think patients and health workers should be involved in this integration process?

    .....

    .....

13. As a stakeholder (or patient), what role do you think traditional medicine should play in Uganda's national health information system?

    .....

    .....

Appendix 2: Budget

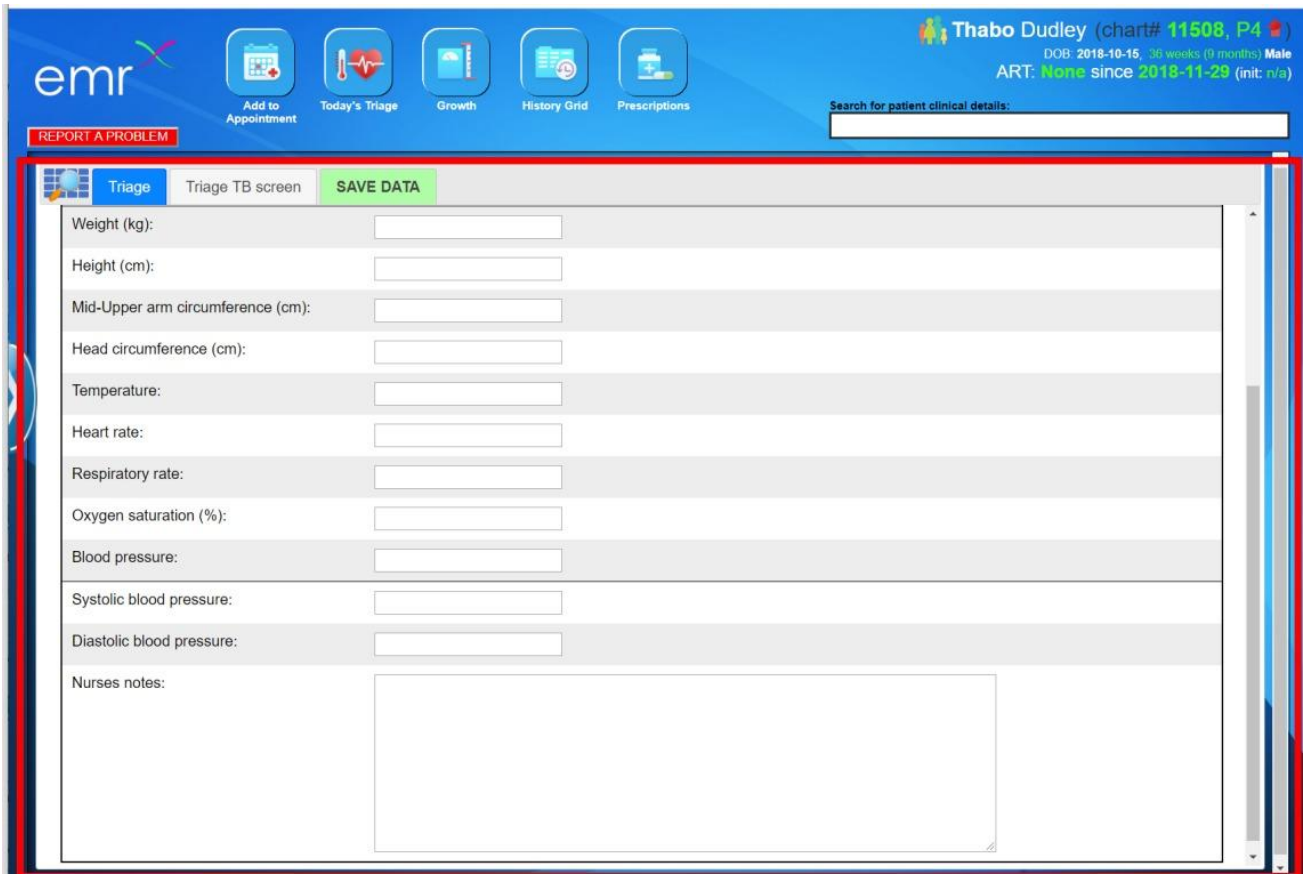
Field Work Budget

Category	Unit	Freq	Qty	Unit Cost	Amount (UGX)
Assorted Stationery (Reams, Pens staples etc)	Assorted	1	1	100,000	100,000
Transport costs	Lumpsum	1	1	350,000	350,000
Interpretation	People	10	2	10,000	200,000
Secretarial costs	Lumpsum	1	1	50,000	50,000
Accommodation	Person	10	1	50,000	500,000
Internet data	Person	1	1	200,000	200,000
Grand Total				760,000	1,400,000

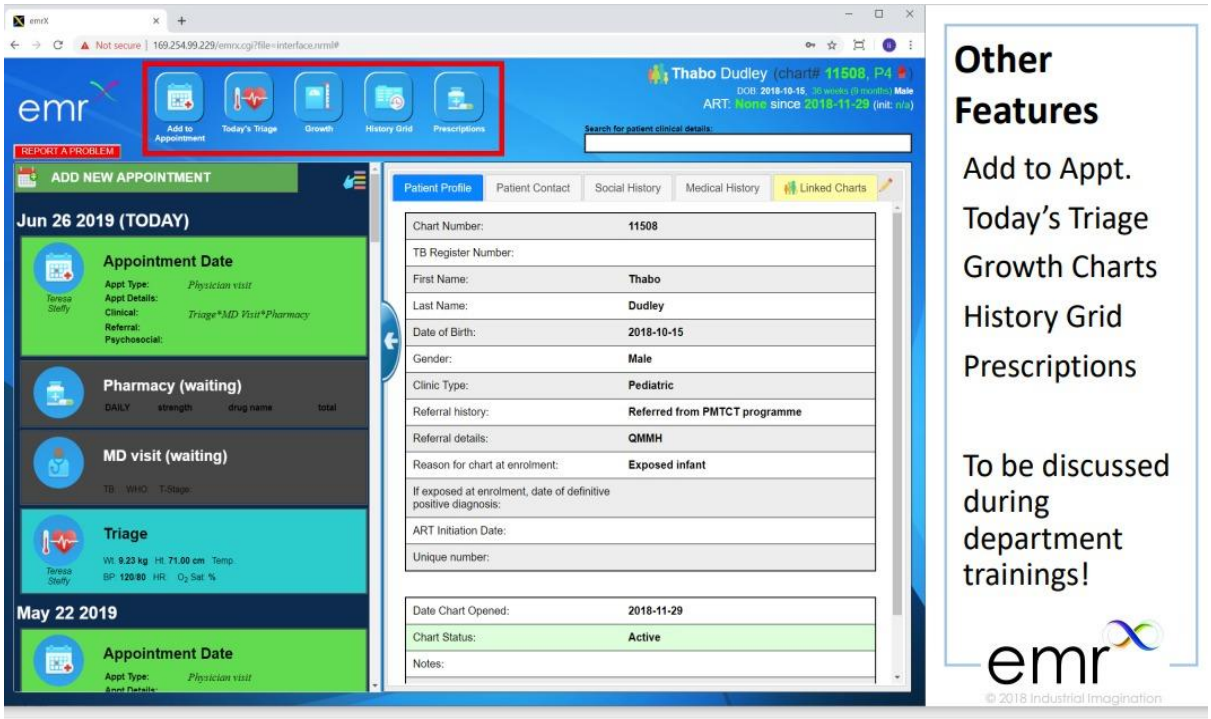
Appendix 3: Workplan

Tasks	Jan-25	Feb-25	Mar-25	Apr-25	May-25	Jun-25	Jul-25	Aug-25
Concept development								
Literature review								
Proposal development								
Data collection								
Framework identification and development								
Research report writing								
Prepare presentation materials								
Dissertation defense								

Appendix 4: patients entry form



Appendix 5: drug prescription area for the EMR



Appendix 6: common variables in EMR

Variable	Type	Purpose
date	datetime	Date that the record was first created
_patient_id	int(11)	Permanent Identifier for patient (most users use chart_number but since the patient's chart number can change, _patient_id is the permanent identifier for the patient) This is the same as the previous EMR except that emr^X stores this variable in all tables related to the patient to identify relations faster.
table_finalized	tinyint(4)	If the user has finished entering data into the table, this value will be 1.
table_finalized_by	varchar(64)	Username of the user who saved the data.
table_finalized_date	datetime	Date and Time that the table was finalized by the user.
_[tablename]_id	int(11)	Index for records in the table (automatically increments)
_[tablename]_timestamp	timestamp	Date and Time of any updates to the record. This may be different from "date" or "table_finalized_date" if data has been modified in the record. This represents the last time the record was updated in any way.

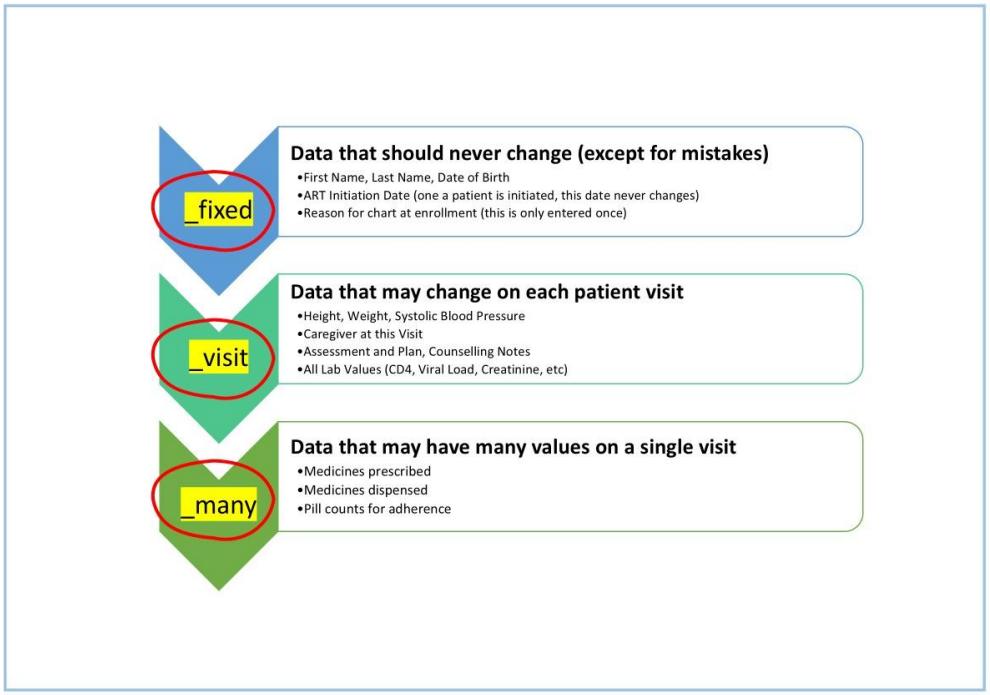
Common Variables

All tables have certain special variables.

Some of these variables can be used to help index records.

emr

Appendix 7: emr^{x} Tables



emr^{X} Tables

The new Database structure is similar, however the name of the table includes a suffix that indicates the category of data that is stored inside.

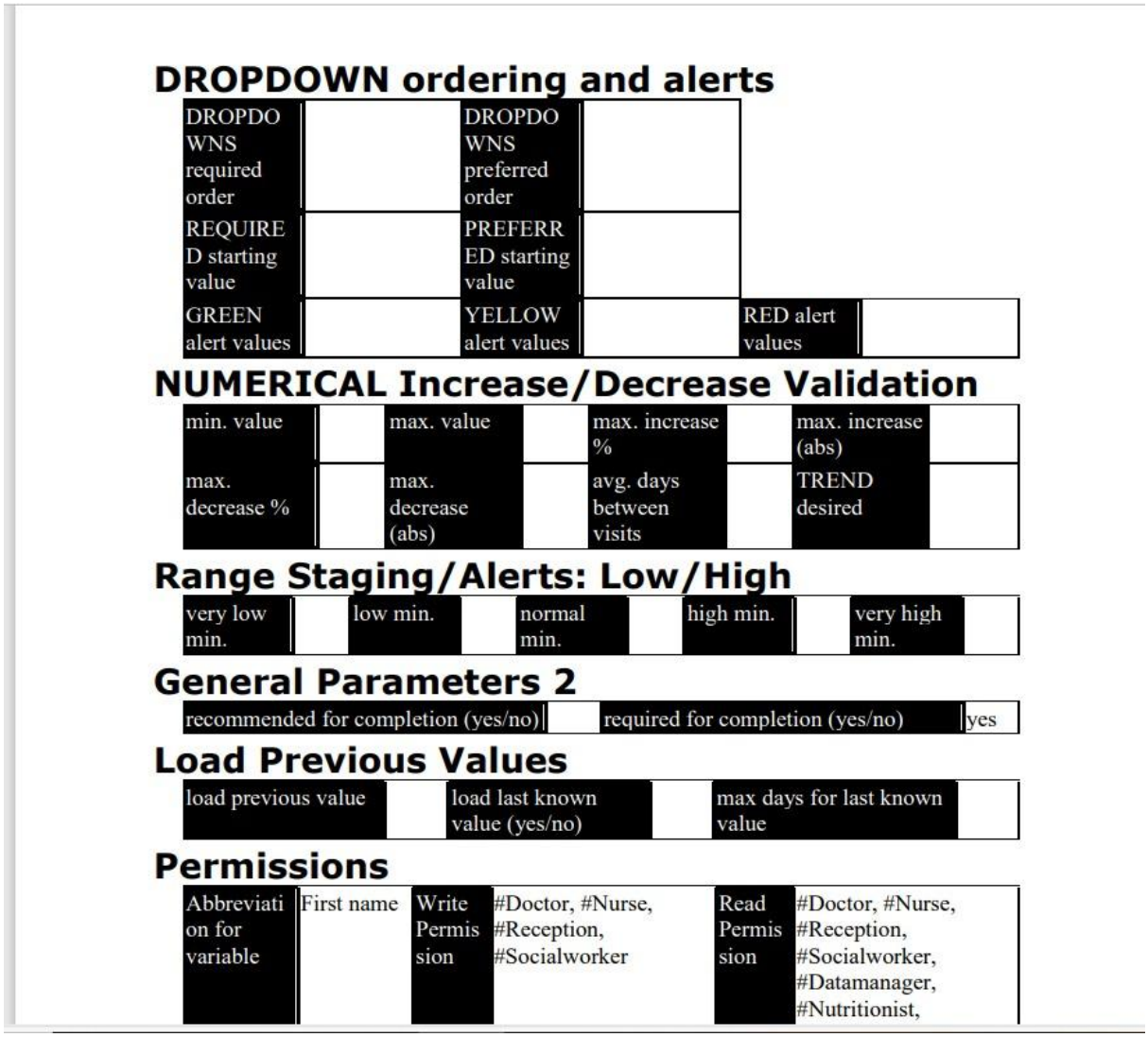
Looking at the list of tables:

- patientprofile_fixed
- triage_visit
- pharmacy_many
- assessmentandplan_visit

...there was no way of knowing what category of data (FIXED, ROUTINE, etc) was stored inside.

emr

Appendix 8: Data structure



DROPDOWN ordering and alerts

DROPDOWNS required order		DROPDOWNS preferred order			
REQUIRED starting value		PREFERRED starting value			
GREEN alert values		YELLOW alert values		RED alert values	

NUMERICAL Increase/Decrease Validation

min. value		max. value		max. increase %		max. increase (abs)	
max. decrease %		max. decrease (abs)		avg. days between visits		TREND desired	

Range Staging/Alerts: Low/High

very low min.		low min.		normal min.		high min.		very high min.	

General Parameters 2

recommended for completion (yes/no)		required for completion (yes/no)	yes

Load Previous Values

load previous value		load last known value (yes/no)		max days for last known value	

Permissions

Abbreviation for variable	First name	Write Permission	#Doctor, #Nurse, #Reception, #Socialworker	Read Permission	#Doctor, #Nurse, #Reception, #Socialworker, #Datamanager, #Nutritionist,

Appendix 9: Acceptance letter from Baylor Uganda

Block 5, Mulago Hospital
P. O. Box 72052, Clock Tower
Kampala - Uganda
Tel: +256-(0)-417-119100
Tel: +256-(0)-312-119100
Fax: +256-(0)-417-119166
Email: admin@baylor-uganda.org

25 February 2025

BCM/2025/ADMIN/121

Mr. Kiyimba Lameck
Department of Information Systems
Uganda Martyrs University- Lubaga Campus
+256772898311 kiyimba.lameck@stud.umu.ac.ug

Dear Mr. Kiyimba,

RE: ADMINISTRATIVE CLEARANCE TO CONDUCT INTERVIEWS FOR YOUR RESEARCH PROJECT: "FRAMEWORK FOR INTEGRATION OF TRADITIONAL MEDICINE INTO THE EMR"

This letter grants you administrative clearance to conduct interviews for your study at Baylor College of Medicine Children's Foundation-Uganda Centre of Excellence (COE) Clinic.

Traditional medicine is widely used by patients in both rural and urban areas, although there is limited documented evidence of its success beyond patient testimonials. This issue requires thorough investigation and may inform the possible integration of traditional medicine into the Health Management Information System (HMIS), such as the Electronic Medical Records (EMR).

Your research aims to determine the percentage of the population that uses or has used traditional medicine, identify the illnesses it has treated, the sources of the medicine, the measurements used, and reasons for choosing traditional medicine. Additionally, you will gather insights from health workers regarding their experiences with traditional medicine, potential challenges to its adoption, and the feasibility of including it under the prescriptions section in the EMR, especially in areas with substantial evidence of effectiveness.

This study aligns with our commitment to conducting research that informs decision-making and improves treatment outcomes. As a clinical research site, Baylor values studies that contribute to holistic patient care. We wish you success in your research and hope it achieves its objectives.

Yours sincerely,

Dr. Adeodata R. Kekitiinwa
Principal Investigator Baylor CRS