UTILIZATION AND ACCEPTABILITY OF THE SCAN FORM TECHNOLOGY FOR HEALTH, A DATA CAPTURE TOOL, IN HOMABAY COUNTY – KENYA

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DECLARATION AND APPROVAL

This thesis is my original work and has not been presented for and an award of a diploma or a conferment of a degree in any other university or institution.

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ABSTRACT

The health sector has adopted scan form technology for record keeping in Kenya and other African nations. Healthcare workers use smartphones to capture images of filled-out scan form registers, which are automatically uploaded to a scan form server. However, around 20 to 25 healthcare facilities frequently miss the weekly deadline for uploading images. Additionally, 10-15 facilities rely on manual counting for generating reports, and 10-15 do not adhere to standards for documenting on forms. The objective of this study was to determine factors influencing utilization of the SFT by health facilities in Homabay County. Specifically, the study determined the extent of use, barriers to utilization and user acceptability and satisfaction with SFT in Homa Bay County. The study was conducted in 54 health care centres in Rachuonyo North and Homa Bay Township sub-counties of Homa Bay County. Data was collected using structured questionnaires, key informant interview guides and focus group discussion guides. Quantitative data was analysed using SPSS software and Qualitative data was transcribed and analysed using NVIVO software. Responses were obtained from 127 healthcare workers, 12 Key informants and 2 FGDs with six participants each (12 health care workers). Inferential analysis tests included chi-square tests and logit regression analysis. The result showed that majority (84.2%,107/127) of the respondents have ever used SFT. Acceptance and satisfaction (59.1%, 75/127) with SFT was also observed among healthcare workers in Homabay County. Barriers to utilization of SFT included incompatibility between SFT and health care workers' tasks ($p = 0.035$) and inadequate ICT support for information exchange, communication, and collaboration in the health facility ($p = 0.021$). On the other hand, the qualitative results showed that inadequate training of staff on use of SFT, poor attitude towards SFT, internet problems, and inadequate staffing of the health facilities are the main challenges facing utilization of SFT in Homabay County. Thus, for successful implementation of SFT, the health service providers and other health stakeholders should address the aforementioned factors to improve utilization of SFT among health care workers. The study recommends training healthcare workers on the use of SFT, providing ICT personnel on standby, improving communication infrastructure, and addressing the problem of understaffing in remote dispensaries and other health centres.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIRS	Africa Indoor Residual Spraying
ART	Antiretroviral Therapy
CDC	Centre for Disease Control (CDC)
ERC	Ethical Review Committee
GoK	Government of Kenya
HBCG	Homa Bay County Government
HIGDA	Health Informatics Governance and Data Analytic
HIPORS	HIV Implementing Partners Online Reporting System
HIS	Health information system
HIV	Human Immunodeficiency Virus
HBCIDP	Homabay County Integrated Development Plan
HRIO	Health Records and Information Officer
ICT	Information and Communication Technology
JOOUST	Jaramogi Oginga Odinga University of Science and Technology
KEMRI	Kenya Medical Research Institute
KHIS	Kenya Health Information System
M & E	Monitoring and Evaluation
MLA	Measurement, Learning, And Accountability
MoH	Ministry of Health
mHealth	Mobile Health
eHealth	Electronic Health

NACC	National AIDS Control Council
NPS	Nursing Process System
PMI	Presidential Malaria Initiative
RMNCAH	Reproductive, Maternal, Newborn, Child, And Adolescent Health
SARs_CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
TB	Tuberculosis
USAID	United States AID
VL	Vector Link
QED	Quantitative Engineering Design

DEFINITION OF TERMS

eHealth: This is the delivery of health care services using modern electronic information communication technologies when patients and health care workers are not directly in contact, and their interaction is facilitated by electronic means.

mHealth: This a practice of public health and medicine supported by mobile devices

Scan Form Technology: This is a technology where handwriting on a paper is transcribed into digital data with a single photo taken by a smart phone, eliminating human errors and saving time

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The integration of technology in the healthcare sector has revolutionized the way healthcare services are delivered. Electronic health (eHealth) is one such integration that refers to the use of information and communication technologies (ICT) in the healthcare sector to improve the efficiency, safety, and quality of healthcare services (Downes *et al.*, 2019). Over the past few years, eHealth has gained popularity and has become an umbrella term for various applications such as electronic health records (EHRs), telemedicine, mobile health (mHealth), and health information exchange (HIE). These applications have the potential to provide patients with easy access to their medical records and healthcare providers, regardless of their location, leading to improved healthcare outcomes (Alverson, 2021).

One of the key components of eHealth is the use of scanning technology to capture patient data in real-time. Scan form technology (SFT) for health involves the use of optical character recognition (OCR) software to convert handwritten or printed text into digital data that can be stored in a database or electronic health record system (Ji *et al.*, 2016). This technology has been widely used in clinical settings for data capture, particularly in research studies where large volumes of data need to be collected quickly and accurately (Hayden *et al.*, 2013). The use of scan form technology in electronic health has several benefits. Firstly, it enables the automatic capture and processing of data, reducing the need for manual entry and thus reducing the likelihood of errors. Secondly, it facilitates the sharing of information between healthcare providers, which can improve the quality and safety of patient care. Finally, it allows for the efficient management of patient data, which can improve the overall efficiency of healthcare services (Susanto & Chen, 2017).

However, the use of scan form technology in electronic health also presents some challenges. For example, the accuracy of OCR software can vary depending on the quality of the scanned document and the clarity of the handwriting. In addition, there may be issues related to data privacy and security, as patient data is being transmitted and stored electronically (Ji *et al.*, 2016). Electronic health and scan form technology have the potential to revolutionize the healthcare sector by improving the efficiency, safety, and quality of healthcare services. While there are some challenges associated with the use of this technology, these can be mitigated with proper planning

and implementation. As such, scan form technology is likely to play an increasingly important role in healthcare in the years to come.

A study conducted in the United States found that scan form technology has been increasingly used among healthcare workers for data collection and analysis (Rothwell *et al.*, 2017). The study surveyed 540 healthcare workers across different healthcare settings, including hospitals, clinics, and research institutions. The results showed that 80% of the respondents reported using scan form technology for data collection, with the most common applications being patient surveys, medical records, and clinical trials. Similarly, a study conducted in Australia found that scan form technology has been widely adopted in the healthcare sector for various purposes, including patient registration, data entry, and quality assurance (Tucker & Miles, 2019). The study surveyed 212 healthcare workers across different healthcare settings, including hospitals, community health centres, and general practices. The results showed that 60% of the respondents reported using scan form technology for data collection and management.

Despite its potential benefits, there are still barriers to the utilization of scan form technology (SFT) in the health sector. A report by Lübbeke *et al.* (2018) indicated that some health professionals may lack familiarity with the technology or lack access to necessary equipment, such as SFT scanners and forms. Additionally, SFT may not be suitable for all types of data collection, as it relies on respondents filling in specific areas on a form (Kane-Gill *et al.*, 2019). However, overall acceptance and satisfaction with SFT in the health sector have been positive. In a study of patient-reported outcome measures (PROMs) in orthopaedics in Switzerland, researchers found that patients generally reported high levels of satisfaction with the SFT-based data collection method (Lübbeke *et al.*, 2018). Similarly, in a study of postoperative pain management in the United States, researchers found that SFT was well-received by healthcare professionals and perceived to be an efficient method for data collection (Kane-Gill *et al.*, 2019). Scan form technology has been utilized in various areas of the health sector globally, and while there are some barriers to its utilization, such as equipment costs and limitations in data collection, users generally report high levels of acceptance and satisfaction with the technology.

In the African health sector, scan form technology has been used in various applications, including patient registration, medical record keeping, and data collection for research studies. An illustration of its use can be seen in a Nigerian study that utilized scan forms to collect data on

hypertension prevalence among adult residents in a rural community, demonstrating the effectiveness and positive reception of scan form technology by study participants (Akintunde *et al.*, 2016). However, there are barriers to its adoption in the African health sector. Cost is a major obstacle, as the technology can be prohibitively expensive for many health facilities, and issues related to electricity and internet connectivity pose challenges for its operation(Chen *et al.*, 2017). Despite these hurdles, there is evidence indicating that scan form technology is generally accepted and well-received in the African health sector. A study in Ghana found that healthcare workers expressed satisfaction with the use of scan forms for patient registration and perceived the technology as reliable and efficient (Gyasi *et al.*, 2019). Although barriers exist, scan form technology shows promise and acceptance among healthcare workers and patients in the African health sector.

The Kenya Health Act of 2017 emphasizes the importance of standardizing health information exchange through an interoperability framework and establishing a comprehensive integrated health information system (GoK, 2017). It recognizes eHealth as a model for health services, which is an emerging field at the intersection of medical informatics, public health, and business. eHealth refers to delivering or improving health services and information through the internet and similar technologies(PALLIPEDIA, 2021). The Ministry of Health (MoH) health information system (HIS) is responsible for capturing, processing, and generating health reports using health information data. Health Information Technology is known to enhance patient care(McCullough *et al.*, 2013). Accurate, timely, readily available, and complete data is essential for optimal health system functioning, and it can only be achieved by a well-matured and integrated HIS.

The current MoH HIS for data processing and report generation has gaps that make it inaccurate (Karuri *et al.*, 2014). The PALLADIUM International/Tupime Kaunti project found that over 90% of data errors in KHIS resulted from human mistakes during the transfer of data from primary sources to summary reports, and these errors were compounded during transmission to higher levels. As a result, the reliability of the data was compromised. To address this issue, the project is introducing digital solutions in Homa Bay and Migori counties, which have the potential to reduce these errors and improve data quality (Liyanage *et al.*, 2020). SFT is a new technology that aims to address the weaknesses of the current MoH HIS technology. However, it is not the first and certainly not the last intervention of its kind in HIS technology. Health information system

technology has been a major innovation in managing health information. In this regard, a good case study is the analysis by Liyanage *et al.* (2020) of the impact of digital health systems on hospital administration and patient care in low- and middle-income countries. They found that these systems can significantly improve healthcare outcomes.

In 2020, SFT technology, was piloted in Kenya by the Kenya Medical Research Institute (KEMRI)/Centre for Disease Control (CDC) in collaboration with the PALLADIUM GROUP (UK Research and Innovation, 2020). The piloting of this HIS technology was conducted in Siaya, Migori, and Homabay counties in western Kenya (QED, 2020b). SFT utilizes scan form health registers, which are manually filled out by healthcare workers. Pictures of the filled-out registers are taken using a mobile phone and uploaded onto a scan form server. The digital data is then processed, verified, and refined to generate summaries and reports for review by the Sub County Health Records and Information Officer (HRIO). Finally, the data is entered into the Kenya Health Information System (Scanform, 2020). Technological advancements in healthcare information systems are of great importance to the healthcare sector (Liyanage *et al.*, 2020). The benefits of such advancements include the availability of sufficient information on patients, integrated medical records, and an increased life expectancy due to the use of technology (Rauv, 2021). With the availability of informatics reports to track various health challenges, life expectancy is significantly higher than it was a few decades ago (Rauv, 2021).

With the emergence of new technological trends, Health Information Systems (HIS) has become one of the most challenging and promising fields for research, education, and practice in medical informatics. This field has significant benefits for medicine and healthcare in general (Alotaibi & Federico, 2017). The ever-demanding field of health, coupled with a myriad of ever-emerging health disorders and conditions such as the current COVID-19 pandemic caused by the SARS-CoV-2 virus, presents a worthy challenge for new technologies in HIS management, such as SFT. SFT has already been successfully implemented in several countries, including Burkina Faso, Ethiopia, Ghana, India, Kenya, Malawi, Mexico, and Nigeria (Scanform, 2020). Therefore, it is important to embrace new technologies like SFT in HIS management for research and development in healthcare.

In Kenya, the use of mobile technology in data collection has increased significantly in recent years, especially in rural areas where internet connectivity is limited. The use of scan form

technology has been adopted in many areas, including healthcare, to improve data quality and management. Homa Bay County, one of the counties in Kenya, has adopted scan form technology as a data capture tool. However, there is a need to evaluate the extent of utilization of the scan form technology, identify the barriers to its utilization, and determine user acceptability and satisfaction. The study investigates the extent to which this technology is used in Homa Bay County, as well as the barriers to its utilization, such as Effectiveness and reliability of SFT, Compatibility between SFT and health care workers' tasks and ICT support for information exchange, communication, and collaboration in the health facility .The study also assess user acceptability and satisfaction with SFT in Homa Bay County, with a focus on how this technology impacts the efficiency, safety, and quality of healthcare services. The findings from this study informs the future use of SFT in healthcare settings in Kenya and other similar contexts.

1.2 Statement of the problem

According to the ministry of health, in Kenya, all the levels of the health care system are required to report on a weekly and a monthly basis (Ministry of Health, 2016). Hundreds of reports are then generated both for the county and national government, including the various health development partners. These reports are relied upon in public health for intervention through data-driven decision making, development of policies, budget allocation and advocacy in health (Kruk *et al.*, 2018). In recent years, data management and analysis have become an essential aspect of monitoring and evaluation of public health programs in developing countries. The use of technology in data management has improved the quality, accuracy, and efficiency of data collection and analysis. In Homa Bay County, Kenya, the government has implemented the scan form technology as a data capture tool for public health programs.

According to the Tupime Kaunti project, Homa Bay Township and Rachuonyo North Sub-counties are the two main sub-counties in Homa Bay County that are currently implementing the SFT. Homa Bay County has 260 health facilities including nine tiers, three hospitals, and four mission hospitals (HBCIDP, 2022). The rest are health centres and dispensaries most of which are connected to community health units. These facilities are manned by 941 personnel mostly nurses. The doctor to population ratio is at 1:40,000 while the nurse to population ratio is at 1:1,500 (HBCIDP, 2022). This is far much below the national average, 14:100,000 for doctors-population and 42:100,000 for nurses-population, hence the need for more measures to better health care

service delivery by adopting an efficient HIS technology (MOH, 2019). Homa Bay Township sub-county and Rachuonyo North sub-county have a total of fifty-four (54) GoK health facilities. All the fifty-four (54) GoK health facilities were required by PALLADIUM GROUP/Tupime Kaunti project to stop using the existing MOH health information system and adopt the use of the SFT in August 2020 with health care workers in the health facilities having undergone all the required training.

However, weekly/monthly support supervision and data quality assessments by Health Informatics Governance and Data Analytics (HIGDA) show that not all 54 health facilities have fully embraced the use of the SFT. The Health Informatics Governance and Data Analytics Project (HIGDA) is a five-year project tasked with assisting the Kenyan government's health sector in strengthening organizational and management capacity in governance, health informatics, data analytics, monitoring, evaluation, learning, and accountability at the national and county levels. According to HIGDA, between 20-25 health facilities do not upload the recommended weekly images on time, 10-15 health facilities resort to manual count at the end of the month to generate reports and about 10 health facilities do not follow the set procedures on how to document on the forms (HIGDA Factsheet, 2019).

The study aims to investigate the utilization of scan form technology, a data capture tool, in Homa Bay County, Kenya, as well as to identify barriers to its utilization and evaluate user acceptability and satisfaction. Despite the increasing use of scan form technology in data collection, there is limited information on its utilization and acceptance in Homa Bay County, which hinders efforts to improve data quality, management, and decision-making. Therefore, this study seeks to fill the knowledge gap and provide insights that can inform the effective implementation and use of scan form technology in Homa Bay County.

1.3 Objective of the study

1.3.1 General objective

To investigate the utilization of scan form technology, a data capture tool, in Homa Bay County, Kenya, as well as to identify barriers to its utilization and evaluate user acceptability and satisfaction.

1.3.2 Specific objectives

1. To assess the extent of use of the scan form technology by the staff in Homa Bay County.
2. To establish barriers to utilization of the scan form technology in Homa Bay County.
3. To establish acceptance and satisfaction with scan form technology in Homa Bay County.

1.4 Research questions

1. What is the extent of use of the Scan form technology in Homa Bay County?
2. What are the barriers to the utilization of the Scan form Technology in Homa Bay County?
3. What is the acceptance and satisfaction with the scan form technology in Homa Bay County?

1.5 Justification of the study

Electronic health (eHealth) has the potential to improve the efficiency, safety, and quality of healthcare services. One of the key components of eHealth is the use of scan form technology (SFT) which has been widely used in research studies for data capture. While there is evidence to suggest that scan form technology is generally accepted and well-received in the African health sector, there are still barriers to its utilization such as the cost of the technology, and challenges related to the availability of electricity and internet connectivity. In Homabay County, Kenya, there is a need to establish the barriers to utilization of SFT to improve the efficiency, safety, and quality of healthcare services, given the unique challenges faced by the region in terms of healthcare infrastructure and resource constraints. The study also investigated the acceptability and satisfaction with of SFT among healthcare workers. Investigating the acceptability and satisfaction of healthcare workers with SFT provides valuable insights into the usability and effectiveness of the technology in improving healthcare services in the region. If healthcare workers find the technology acceptable and satisfying, it is more likely to be adopted and integrated into their daily practices.

1.6 Significance of the Study

The study is significant in several ways. Firstly, it contributes to the body of knowledge on the utilization of SFT in the African health sector, particularly in resource-constrained regions such as Homabay County. This knowledge can inform policy and practice in the region and beyond, by identifying best practices and potential barriers to the utilization of SFT in the healthcare sector. The study also provides valuable insights for healthcare practitioners and policymakers on how to

improve the utilization of eHealth technologies such as SFT in the region, to address the unique challenges faced by the healthcare sector in Homabay County.

1.7 Scope of the study

The aim of this study was to investigate the utilization of scan form technology, a data capture tool, in Homa Bay County, Kenya, as well as to identify barriers to its utilization and evaluate user acceptability and satisfaction. The study specific objectives were to assess the extent of use of the scan form technology, establish barriers to utilization of the scan form technology, and to establish the user acceptability and satisfaction with scan form technology among health care workers in Homa Bay County. The study was conducted in 54 health care centres in Rachuonyo North and Homa Bay Township sub-counties of Homa Bay County. Data was collected using structured questionnaires, key informant interview guides, and focus group discussion guides. The study employed inferential analysis tests such as chi-square tests and logit regression analysis to analyze the collected quantitative data, while qualitative data was transcribed and analysed using NVIVO software. The study obtained responses from 127 healthcare workers (including clinicians, nurses, medical doctors, ward clerks and medical records officers), 12 key informants, and 2 FGDs with six participants each (12 health care workers).

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this chapter, this study takes a closer look at the factors that impact the utilization of Scan Form Technology (SFT) by healthcare workers. The discussion begins with an introduction to SFT, followed by a review of its utilization in healthcare settings. The chapter then explores the obstacles that hinder the adoption of this technology in health facilities, as well as user satisfaction and acceptance of SFT in such environments. The overall goal of this chapter is to provide a comprehensive overview of the various aspects surrounding the use of SFT in healthcare settings.

2.2 A review of scan form technology

Quantitative Engineering Design (QED) is a renowned technology company that specializes in implementing cutting-edge technologies for various industries. One of their core areas of expertise is Scan form technology (SFT), which involves using Optical Character Recognition (OCR) software to convert handwritten or printed text into digital data (QED, 2022). QED's state-of-the-art OCR software has the capability to recognize various forms of handwriting and printing, enabling them to provide fast and accurate data capture services (QED, 2022). This technology has been widely adopted in clinical settings, especially in research studies where there is a need to collect large volumes of data quickly and accurately. A study by Ji *et al.* (2016) showed that SFT is effective in clinical settings and has been instrumental in improving the overall quality of patient care. By utilizing SFT, healthcare providers and researchers can save time, reduce errors, and improve patient care.

As a result of the importance of health information, there is a need for a more accurate system for data capture and processing hence the introduction of SFT. According to PALLADIUM GROUP (Tupime Kaunti project), SFT uses a scannable register that has been manually filled by a health care worker in a health facility to auto-generate weekly and monthly reports for the health facility (Maïga *et al.*, 2019).

Manual records are still in place and health care providers must extract data from them, to monitor epidemics and optimally allocate required medical resources. The manual transcription of handwritten records, from one system to another, results in a snowballing cascade of errors in the statistics reported to governments and donors, a weakness that the SFT can resolve (Scanform, 2020).

SFT uses artificial intelligence to perform its mandate. Health care providers simply take pictures of the filled pages of the scan form registers using a smartphone, the pictures are then automatically uploaded on a scan form server. Once the upload has been done, the technology processes the data and auto-generates weekly and monthly summary reports for the specific health facilities for entry into the Kenya Health Information System and use (Scanform, 2020)

The advantage of SFT over the existing health information system is that it makes real-time surveillance possible even in rural parts of the country with no proper electronic infrastructure. Surveillance of malaria, tuberculosis (TB), and human immunodeficiency virus (HIV) is crucial. SFT has several benefits as a HIS technology. Generation of patient line data; auto-generation of monthly summary reports; and creating more time for the health care providers to provide quality services to patients are some of the major benefits of this HIS. SFT also leads to the generation of timely and high-quality reports that can be relied upon in public health for policy formulation and monitoring (Scanform, 2020).

2.3 Theoretical literature

The Health Informatics Governance and Data Analytics Project (HIGDA) is a five-year project mandated to support the health sector of the Government of Kenya (GOK) to strengthen national and county organizational and management capacity in governance, health informatics, data analytics, monitoring, evaluation, learning and accountability (HIGDA Factsheet, 2019). According to HIGDA Fact Sheet 2019, since October 2016, it has supported the establishment and inauguration of the Health Information and Research interagency coordinating committee. The committee, led by the MoH, brings together all key stakeholders in HIS/monitoring & evaluation and plays a critical role in coordinating informatics investments. In embracing health information and research, there is a need for a well-informed interagency coordinating committee that relies on more accurate data through a reliable and consistent platform. This is the background under which scan form technology should be adopted.

Plan International, Tupime Kaunti launched a program dubbed “Project Balance” which worked with Plan International for five years, the year 2016 to the year 2021, as a USAID-funded project supporting the Kenya Health Sector in HIV, malaria and reproductive, maternal, newborn, child, and adolescent health (RMNCAH) programs (Project Balance, 2020). The project focused on working with county governments to strengthen monitoring evaluation and learning systems to

provide quality data and synthesized information for planning, implementation, policy development, and decision making. This was not adequate since there is a prerequisite need for the most effective and reliable HIS technology to guarantee county governments strong monitoring evaluation and learning systems.

According to Homa Bay County Report on the HIV Implementing Partners Online Reporting System (HIPORS) for the Financial Year 2016/2017, 80% of the HIV response is funded by Development Partners (Homa Bay County Report on the HIV Implementing Partners Online Reporting System (HIPORS) for the Financial Year 2016/2017, 2018, p. 2). Development partners, therefore, need adequate and accurate country and county reporting of HIV and AIDS activities and investment allocation against utilization. This is only possible through a more reliable and efficient HIS Technology (National AIDS Control Council, 2018)

According to the National AIDS Control Council (NACC), HIV prevalence in Homa Bay County is nearly 4.5 times higher than the national prevalence at 26.0% (MOH, 2016). There is a need therefore for a more streamlined data collection and processing through a technological HIS in Homabay County to report on all the public health interventions for adequate funding. Tupime Kaunti Project as a USAID-funded activity, relies on data to give feedback to USAID for further funding. According to PALLADIUM GROUP, the Tupime Kaunti project developed data collection tools in MS Excel and MS Word to facilitate support supervision and assessments of some of its projects. The Project experienced functionality limitations in the use of MS Excel and MS Word such as lack of skip logic and inability to configure complex business rules (MOH, 2018). The project, subsequently, engaged a consultant to adopt three of the tools (HIS Checklist; Malaria Scan form technology, and data quality assessment maturity model) into web-based applications that can be used on desktop and mobile devices. Tupime Kaunti project then adopted the Malaria scan form technology. Scan form technology has therefore been considered to be a more efficient and effective technology in HIS (National AIDS Control Council, 2018).

This scan form technology has been used for several years for epidemiological surveillance in Kenya and has been highlighted on The Gates Notes (qed, 2020a). It makes near real-time surveillance possible even in rural areas lacking electronic infrastructure, but where the surveillance of malaria, HIV, and TB is still crucial. Paper guarantees that data entry is straightforward and scalable, and Scan Form ensures that data is received (Scanform, 2020).

According to Dr. Pedro L. Alonso, Director, Global Malaria Program, WHO; "Weak data collection systems are hampering a timely and effective response to malaria" (Scanform, 2020)

2.4 Empirical literature

The use of weak data collection systems is hampering a timely and effective response to some diseases. Weak data collection systems lead to numerous errors which give chance for poor health services to the health care consumers. Weak data collection systems then lead to weak reports which then misguide policy experts (Biddle *et al.*, 2021).

According to Homa Bay County Integrated Development Plan, 2018 – 2022, (p. 42), "Homa Bay County has 211 health facilities including nine tiers three hospitals and four mission hospitals. The rest are health centres and dispensaries most of which are connected to community health units. These facilities are manned by 941 personnel mostly nurses with a doctor-population ratio still at 1: 40,000 and the nurse-population ratio at 1:1,500. This is below the national average, 14:100,000 for doctors-population and 42:100,000 for nurses-population, and measures should be in place to remedy the imbalance and address the consequent lack of quality health care provided in low tier health facilities." There is a need for further investment in health care services in Homa Bay County by adopting a technology that shall reduce this labour force shortage (HBCIDP, 2022; MOH, 2019).

The five most common diseases in Homa Bay County, accounting for more than 70% of all morbidity are malaria (36 %), upper respiratory tract infection (15%), diarrhoea (11%), pneumonia (10%), and skin diseases (10%) (Machuki *et al.*, 2019). Prevalence of diseases such as pneumonia, meningitis, and tuberculosis have been noted to be on the rise and, save for cases of malaria and diarrhoea, up to 30% of these diseases are linked to HIV/AIDS (Homabay County Integrated Development Plan 2018-2022). Based on this assessment, it would be prudent that a more efficient and reliable HIS technology is adopted to ensure that the right health information is captured and analysed for the next stage of action. Scan form should therefore be embraced for reliable health information.

According to Homa Bay County health report, the County still bears the highest burden of HIV in the country with a prevalence, which is four times the national prevalence (Homabay County Health Fact Sheet, 2018). According to Kenya HIV estimates 2017, Homa Bay County accounted

for 20.7% of HIV prevalence in Kenya. Additionally, the country was ranked second in annual new infections accounting for 4558 new infections (8.6 % of total new infections). It was further estimated that as of 2017, Homa Bay County had 148,657 adults and 9420 children living with HIV in the County (Ministry of Health, 2018). In 2017, the Antiretroviral Treatment (ART) coverage was 64% with 94% of eligible children being on Antiretroviral Treatment. The viral suppression was 75%. HIV positivity among infants has reduced from 13% in 2010 to 3.6% in 2017; an achievement attributed to decentralization of HIV care services, improved laboratory infrastructure, capacity building of staff, increased ART uptake among HIV-positive pregnant and lactating women, and ARV prophylaxis for HIV exposed infants(Homabay County Health Fact Sheet, 2018). This data is a clear indication that there is a need for robust health system strengthening through the adoption of HIS technology that is more accurate and result oriented. Scan form technology is a more accurate HIS technology that matches this need.

According to Homa Bay County Report on the HIV Implementing Partners Online Reporting System (HIPORS) for the financial year 2016/2017; Homa Bay County had a population of 1,101,901, comprising of males (48%) and females (52%). The expended resources on HIV programs reported by NGOs operating in Homa Bay County, according to Kenya HIV Estimates 2015, decreased from KES 1.8 billion in FY 2015/16 to KES 1.7 billion in FY 2016/17, representing a 7% decrease. Such a decrease in funding of HIV in HIV stricken counties is a possible indication of health information mismatch which could have led to a wrong policy (National AIDS Control Council, 2018).

According to U.S. President's Malaria Initiative, Kenya Malaria Operational Plan FY 2020, Homa Bay County is considered an endemic area for malaria transmission. In endemic areas, malaria transmission is intense throughout the year, with high entomological inoculation rates and *P. falciparum* prevalence greater than 20% near Lake Victoria and between 5–20% in coastal counties (U.S. President's Malaria Initiative, Kenya Malaria Operational Plan FY 2020). In 2019, an estimated 27% of the total population (13.7 million) lived in endemic areas, including ? million in the eight lake endemic counties, namely Kisumu, Siaya, Homa Bay, Migori, Kakamega, Bungoma, Busia and Vihiga (Bashir *et al.*, 2019). With this background, Homa Bay County, classified as an endemic area needs to adopt and fully employ scan form technology to make help in improving for HIS discrepancies.

2.5 Utilization of the scan form technology by health care workers

The use of this technology has not gone unnoticed, and its benefits continue to be recognized globally. According to a report by the World Health Organization (WHO), the digitization of health data is crucial to improving health outcomes and achieving universal health coverage in Africa (WHO, 2021). Scan form technology is one of the key solutions proposed to help achieve this goal.

According to a survey conducted in the United States by Rothwell *et al.* (2017), scan form technology has witnessed a significant rise in its usage among healthcare workers for data collection and analysis purposes. The study involved 540 healthcare workers from diverse healthcare settings, including hospitals, clinics, and research institutions. The research findings indicate that a staggering 80% of the respondents reported utilizing scan form technology for data collection, with patient surveys, medical records, and clinical trials being the most frequently used applications. The increasing adoption of scan form technology by healthcare workers highlights the importance of leveraging technological advancements to improve patient care and healthcare outcomes.

A study carried out in Australia by Tucker and Miles (2019) confirms the widespread use of scan form technology in the healthcare sector. The technology is being employed for numerous purposes, such as patient registration, data entry, and quality assurance. The research surveyed 212 healthcare workers from various healthcare settings, including hospitals, community health centres, and general practices. The findings indicated that 60% of the participants were using scan form technology for data collection and management purposes. This high adoption rate illustrates the crucial role that technology is playing in modern healthcare systems. By integrating innovative solutions such as scan form technology, healthcare workers can enhance the accuracy and efficiency of their data collection and management processes, ultimately leading to better patient outcomes.

In the African health sector, scan form technology has been used in a variety of applications, including patient registration, medical record keeping, and data collection for research studies. One example of the use of scan form technology in the African health sector is a study conducted in Nigeria, which used scan forms to collect data on the prevalence of hypertension among adult

residents of a rural community (Akintunde *et al.*, 2016). The study found that scan form technology was effective in collecting accurate and reliable data and was well-received by study participants.

The PALLADIUM GROUP/Tupime Kaunti project has reported that Homa Bay Township and Rachuonyo North Sub-counties are the two main sub-counties in Homa Bay County that are currently implementing the SFT. Homa Bay County has a total of 260 health facilities, including nine tiers, three hospitals, and four mission hospitals, with the rest being health centres and dispensaries that are mostly connected to community health units(HBCIDP, 2022). These facilities are mostly staffed by nurses, with a total of 941 personnel. However, the doctor to population ratio is at 1:40,000, and the nurse to population ratio is at 1:1,500, which is far below the national average of 14:100,000 for doctors-population and 42:100,000 for nurses-population(HBCIDP, 2022). Therefore, there is a need to adopt an efficient HIS technology to improve healthcare service delivery, as recommended by the Ministry of Health in 2019(MOH, 2019). The PALLADIUM GROUP/Tupime Kaunti project required all the fifty-four (54) GoK health facilities in Homa Bay Township sub-county and Rachuonyo North sub-county to stop using the existing MOH health information system and adopt the use of the SFT in August 2020, with healthcare workers in the health facilities having undergone all the required training.

However, weekly/monthly support supervision and data quality assessments conducted by Health Informatics Governance and Data Analytics (HIGDA) show that not all 54 health facilities have fully embraced the use of the SFT. The Health Informatics Governance and Data Analytics Project (HIGDA) is a five-year project that is tasked with assisting the Kenyan government's health sector in strengthening organizational and management capacity in governance, health informatics, data analytics, monitoring, evaluation, learning, and accountability at the national and county levels. According to HIGDA, about 20-25 health facilities do not upload the recommended weekly images on time, 10-15 health facilities resort to manual count at the end of the month to generate reports, and approximately 10 health facilities do not follow the set procedures on how to document on the forms, as indicated in the HIGDA Factsheet of 2019(HIGDA Factsheet, 2019).

In Kenya, the use of mobile technology in data collection has increased significantly in recent years, especially in rural areas where internet connectivity is limited. The use of scan form technology has been adopted in many areas, including healthcare, to improve data quality and management. Homa Bay County, one of the counties in Kenya, has adopted scan form technology

as a data capture tool. However, no study has been done to investigate the utilization of scan form technology among health care workers in Kenya and specifically Hama Bay County. This study aims to fill this gap by evaluating the extent of utilization of the scan form technology among health care works in Homa bay County.

2.6 Barriers to utilization of the scan form technology in health care facilities

Scan form technology, a type of electronic data capture (EDC) tool, has the potential to improve the efficiency and accuracy of healthcare data collection. However, there are several barriers to its utilization among healthcare workers in healthcare facilities globally. Studies conducted in different countries have highlighted some of these barriers. Firstly, many healthcare workers in different countries may not be aware of the benefits of scan form technology or how to use it effectively (Korukonda *et al.*, 2018; Osterhage, 2016). As a result, they may not see the value in adopting this technology, or they may not be able to effectively integrate it into their workflows. Secondly, healthcare workers in different countries may be resistant to adopting new technologies due to concerns about the impact on their workloads or the quality of patient care (Johansson *et al.*, 2020; Savitzky *et al.*, 2018). This resistance can be particularly strong in settings where there is a strong culture of paper-based data collection.

A systematic review of existing literature on scan form technology for healthcare data collection conducted by Lübbeke *et al.* (2018) identified several barriers to the utilization of scan form technology among healthcare workers. The study found that the lack of access to necessary equipment, such as scanners and forms, was one of the primary barriers to adoption. This was particularly true for healthcare facilities in low-resource settings, which may not have the budget to invest in new equipment or have access to the latest technology. Moreover, the study found that some healthcare workers may not be familiar with the technology or may not have received adequate training on its use, resulting in a lack of confidence in using the technology, leading to underutilization or avoidance altogether. Finally, concerns around data privacy and security, particularly with the storage of patient data, were also identified as a significant barrier to the adoption of scan form technology among healthcare workers. Healthcare workers may fear the risk of data breaches or unauthorized access to sensitive patient information, leading to resistance towards the technology.

The use of scan form technology in electronic health also presents some challenges. For example, the accuracy of OCR software can vary depending on the quality of the scanned document and the clarity of the handwriting. In addition, there may be issues related to data privacy and security, as patient data is being transmitted and stored electronically (Ji *et al.*, 2016). Studies conducted in African countries have identified barriers to the use of scan form technology in the health sector. According to a study conducted by Chen *et al.* (2017), one major obstacle is the cost of the technology, which can be prohibitively high for many health facilities, particularly those in low-income settings. Additionally, the study revealed that challenges related to the availability of electricity and internet connectivity can hinder the operation of scan form technology.

The lack of reliable electricity can prevent the use of scanners and computers, while poor internet connectivity can make it difficult to upload data to central servers or share data between different facilities (Chen *et al.*, 2017). These challenges can limit the use of scan form technology, particularly in rural and remote areas where infrastructure is limited.

The study by Chen *et al.* (2017) highlighted that addressing the cost and infrastructure-related barriers is crucial to promote the adoption and use of scan form technology in the African health sector. By overcoming these challenges, healthcare workers in Africa can benefit from the improved efficiency and accuracy that scan form technology offers.

Sierra Leone is one of the countries in Africa where there has been resistance to the adoption of scan form technology in health care facilities (Ogundele *et al.*, 2020). This may be due to a variety of factors, including a lack of awareness and education about the benefits of the technology, concerns around data privacy and security, and challenges related to infrastructure and resources. The study by Ogundele *et al.* (2020) found that these challenges need to be addressed in order to promote the adoption of scan form technology in Sierra Leone. Specifically, the study authors recommend improving electricity and internet connectivity, providing training and support to health care providers, and addressing concerns around data privacy and security.

According to the literatures reviewed, there is no existing study that specifically investigates the barriers to the use of Scan form technology among healthcare workers in Kenya or Homabay County. Therefore, the gap in the literature that this study aims to address is the lack of knowledge regarding potential barriers to the adoption and effective use of Scan form technology in healthcare settings in Kenya and Homabay County. By investigating these barriers, this study aims to

contribute to the literature on healthcare technology adoption in low-resource settings and inform the development of effective strategies to promote the adoption and use of Scan form technology among healthcare workers in these areas.

2.7 User acceptability and satisfaction with scan form technology in health care facilities

The implementation of Scan Form Technology in the healthcare industry has been met with favourable reception and contentment. According to a study on PROMs in orthopaedics conducted in Switzerland, patients expressed overall satisfaction with the data collection method based on SFT (Lübbeke *et al.*, 2018). Correspondingly, healthcare professionals involved in a study on postoperative pain management in the United States reported positive feedback on SFT, acknowledging it as a highly efficient approach for data collection (Kane-Gill *et al.*, 2019).

A study conducted in Taiwan to investigated user satisfaction and technology acceptance of the nursing process information system. Within the 3Q (service quality, information quality, and system quality) model, the factors impacting nurses' usage of the Nursing process system (NPS) were examined based on user satisfaction and technological acceptability. Responses of 222 nurses from eight hospitals linked with public organizations in Taiwan were obtained with the help of a questionnaire. It was discovered that user satisfaction influenced behavioural attitudes and intentions to utilize the system by influencing perceived utility, perceived ease of use, and perceived enjoyment (Ho *et al.*, 2019).

In Nigeria, on the other hand, scan form technology has been widely accepted and appreciated by health care providers and patients alike (Adebisi *et al.*, 2021). This is because the technology provides an efficient and accurate way to collect and manage patient information, which can improve the quality of care and reduce errors. In addition, patients appreciate the convenience and speed of the process, particularly in emergency situations. The study by Adebisi *et al.* (2021) highlights the importance of digital health technologies like scan form technology in improving health outcomes in Nigeria.

Similarly, in Kenya, scan form technology has been embraced by health care facilities as a way to streamline data collection and management (Waweru *et al.*, 2019). This technology has been particularly useful in managing chronic conditions like HIV/AIDS, where regular monitoring is required to track treatment progress and manage potential complications. By using scan form

technology, health care providers can accurately capture and manage patient data, which can lead to better coordination of care and ultimately better health outcomes. The study by Waweru *et al.* (2019) emphasizes the potential of digital health technologies to improve health care delivery in Kenya and other countries in Africa.

The lack of a study on user acceptability and satisfaction with scan form technology among healthcare workers in Homabay county, Kenya, represents a significant gap in knowledge. While scan form technology has the potential to improve healthcare delivery and patient outcomes, it is crucial to understand how healthcare workers in this region perceive and use this technology.

By filling this gap in knowledge, the proposed study seeks to contribute to the development of evidence-based policies and strategies for the adoption and implementation of scan form technology in healthcare delivery in Homabay county. Additionally, the study aims to generate knowledge that could be useful in other regions with similar resource constraints and healthcare systems.

Therefore, the study sought to address the research gap by exploring healthcare workers' experiences and perceptions of scan form technology, including their attitudes towards its use, perceived benefits and challenges, and overall satisfaction with the technology. The study also examined the factors that may influence the acceptance of scan form technology in healthcare facilities in Homabay county.

2.8 Conceptual framework

2.8.1 Diffusion of innovation theory

The process of adopting innovations has been studied for over 30 years, and one of the most popular adoption models is described by Rogers (2003) in his book, *Diffusion of Innovations*. Several researchers from varied disciplines have used the model as a framework.

Rogers' diffusion of innovations theory is the most appropriate for investigating the uptake of the scan form technology in Homabay County. Much diffusion research involves technological innovations, so Rogers (2003) used the word "technology" and "innovation" as synonyms. For Rogers, "a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving the desired outcome" (p. 13).

For Rogers (2003), adoption is a decision of "full use of an innovation as the best course of action available" and rejection is a decision "not to adopt an innovation" (p. 177). Rogers defines diffusion as "the process in which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). As expressed in this definition, innovation, communication channels, time, and social systems are the four key components of the diffusion of innovations. A model of five stages in the innovation-decision process is illustrated to support this conceptual framework.

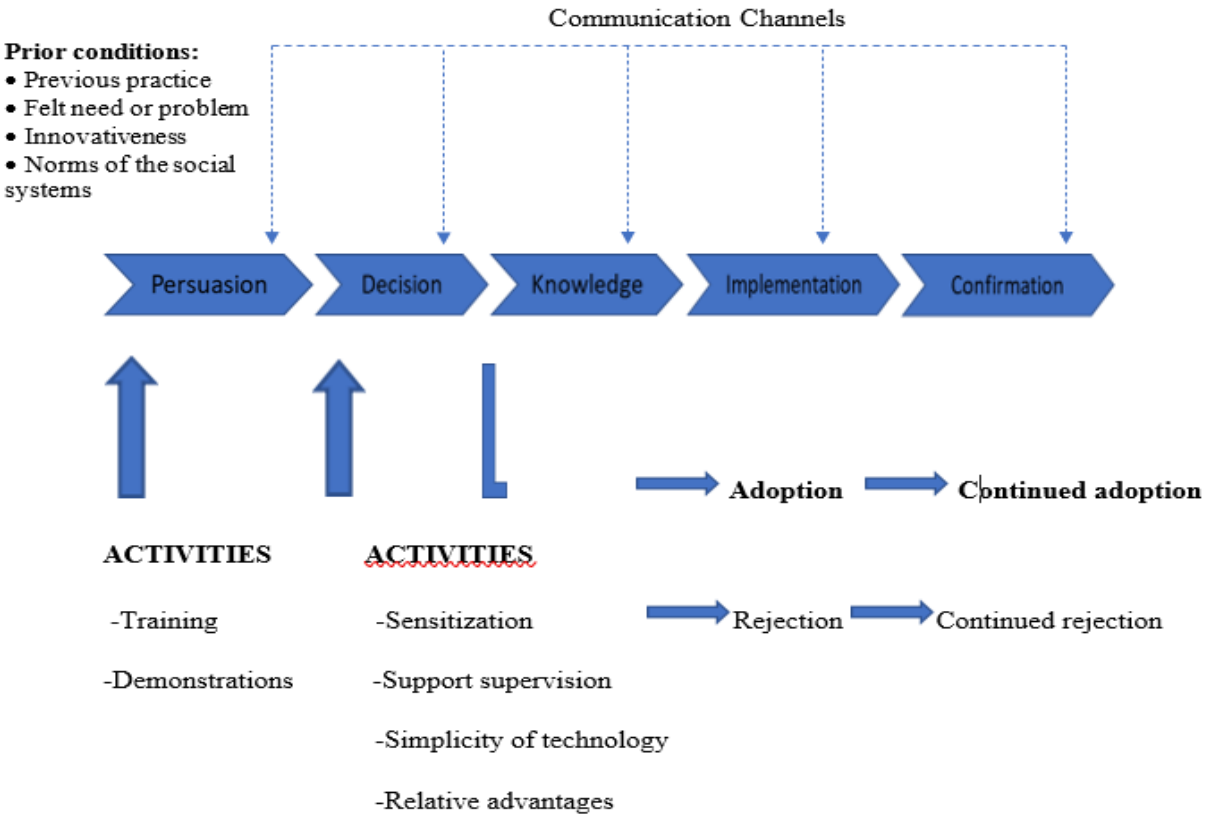

Figure 2. 1 A Model of Five Stages in the Innovation-Decision Process (Source: Diffusion of Innovations, Fifth Edition by Everett M. Rogers. Copyright (c) 2003 by The Free Press. Reprinted with permission of the Free Press: A Division of Simon & Schuster).

2.8.2 Study Conceptual framework

The study aimed to investigate the utilization of scan form technology as well as to identify barriers to its utilization and evaluate user acceptability and satisfaction. A conceptual framework was developed to illustrate the relationships between the independent variables and the dependent

variable. The dependent variable was the utilization of SFT in Homa bay County, while the independent variables included the effectiveness and reliability of SFT, compatibility with healthcare workers' tasks, and ICT support for information exchange, communication, and collaboration.

The study also considered moderating variables such as the age, gender, and years of experience of healthcare workers, which were hypothesized to influence the relationship between the independent and dependent variables. The study hypothesized that adequate training on SFT would improve its effectiveness, compatibility, and ICT support, leading to increased utilization. Older healthcare workers and those with more experience might have different attitudes and training needs. Gender was also considered a potential factor in SFT utilization.

The study conducted a survey among healthcare workers in Homa Bay County to assess the independent variables and analyse the collected data to determine their impact on SFT utilization. Another objective was to examine healthcare workers' perceptions, user acceptability, and satisfaction with SFT. The intervening variables such as perceived usefulness and ease of use were identified as factors influencing user acceptance and satisfaction. Perceived usefulness refers to the belief that SFT would enhance job performance and efficiency, while ease of use referred to the perception that the technology was user-friendly and required minimal effort. Positive perceptions of these intervening variables were hypothesized to result in higher user acceptability and satisfaction with SFT.

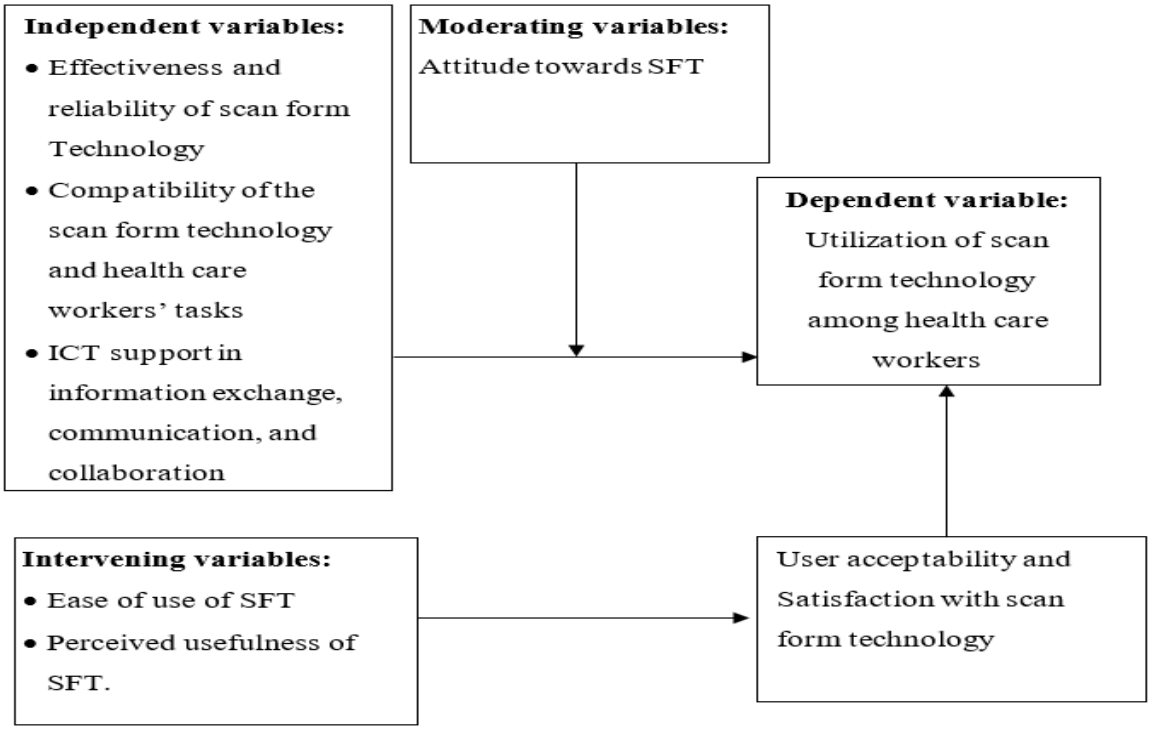

Figure 2. 2. Conceptual framework

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter entailed the approach that was used in research in a systematic way such that the research process can meet the desired objectives.

3.2 Study area

The study was conducted in Homa Bay County, which is in western Kenya. Homa Bay County is a county in the former Nyanza Province of Kenya, and its capital and largest town is Homa Bay. The county has a population of 1,131,950 and an area of 3,154.7 km². Lake Victoria is a major source of livelihood for Homa Bay County. The county has a diverse population, with several ethnic groups, and is primarily inhabited by the Luo community(KNBS, 2019).

3.3 Study site

The study was conducted in selected healthcare facilities in Homa Bay County. The healthcare facilities were chosen based on their availability and willingness to participate in the study. The facilities included hospitals, health centres, and dispensaries.

3.4 Research design

The research design for this study was a cross-sectional mixed-methods approach that utilizes both quantitative and qualitative methods for data collection, analysis, and presentation. Quantitative data was collected using structured questionnaires, while qualitative data was collected through focus group discussions and key informant interviews.

3.5 Study population

The study population consisted of 322 healthcare workers from the 54 Ministry of Health (MoH) facilities in Rachuonyo North and Homa Bay Township sub-counties of Homa Bay County. The healthcare workers were selected from various cadres, including general doctors, nurses, pharmacists, laboratory technicians, clinical officers, and health record officers, based on their availability. Additionally, the study population included SFT program officers, Homa Bay ministry of health officers and management of the health facilities who were selected as key informants.

3.6 Sample size calculation and sampling procedure

3.6.1 Sample size calculation

The study used Slovin's formula (Slovin, 1960) to calculate a sample size from a known population of health care workers. The sample size is calculated as shown below.

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

Where:

n is the sample size calculated

N is the total number of health care workers in the 54 health facilities in Rachuonyo North and Homabay Township Sub-Counties (a total of 322 health care workers)

e is the desired level of precision (marginal error) in this case 5%

$n = \frac{322}{1+(322\times 0.05^2)} \approx 178$ Health care workers.

Since the population of study is less than 10000, the resulting sample size obtained was adjusted using finite population correction formula as shown below;

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Whereby

n is the sample size after adjustment

$n_0 = 178$ is the sample size calculated by the Slovin's formula.

N is the study population which is equal to 322 health care workers.

$$n = \frac{178}{1 + \frac{178 - 1}{322}} \approx 115$$

The sample size was 115 plus 10% for non-response giving 127 health-care workers.

3.6.2 Sampling procedure

The study purposively selected Homabay County, one of the counties where SFT has been piloted in public health facilities by KEMRI/CDC and Quantitative Engineering Data (QED). Using a simple random sampling technique, Rachuonyo North and Homabay Township Sub-Counties, Appendix H and APPENDIX G respectively, were selected from all the sub-counties in Homabay County. All 54 health facilities in the two sub-counties that adopted SFT were included in the study (APPENDIX E). The sample size for each health facility was calculated using the formula =(127*N)/322 in EXCEL, where N is the population of health care providers in each facility, as shown in Appendix E. Health care workers were conveniently selected from each facility until the required number was achieved, since the number of workers from different cadres was not uniformly distributed. The study used convenient sampling to select health care workers from different facilities in Homa Bay County until the target sample size was reached.

For the key informants, the study purposively selected 12 individuals who had direct oversight of the implementation of SFT in their respective facilities, including SFT program officers, Homa Bay Ministry of Health officers, and health facility management personnel. The selection was based on their knowledge and expertise in SFT implementation. During the study only 12 key informants were available and willing to be interviewed giving a sample size of 12. The study did not use any formular to calculate the sample size for KII but rather conveniently sampled respondents with in-depth and detailed information about utilization of scan form technology in Homa Bay County.

For the focus group discussions (FGDs), the study used a convenience sampling technique to select participants from the health care workers in the selected health facilities. The health care workers were divided into three groups, i.e., nurses, clinical officers, and other health care workers (which included general doctors, nurses, pharmacists, laboratory technicians, clinical officers, and health record officers). The FGDs were conducted separately for each group. The study conducted a total of 2 FGDs, that is, 2 FGDs for each group, with each FGD comprising 6 participants. The participants were selected based on their availability and willingness to participate in the study. According to the researcher's judgment and the study design, after conducting 2 FGDs, the data saturation point was reached and additional FGDs could not give new insights. The number of FGDs to be conducted were not predetermined because it depends on several factors such as the

research question, the homogeneity of the study population, and the level of participation in the discussion. However, the study planned to conduct FGDs until it obtains rich and diverse data.

3.7 Data Collection instrument

The study relied on both primary and secondary data sources. Secondary information was obtained through a literature review of books, research reports and administrative records, journals and other publications, mainly to establish the existing knowledge base concerning the research issue at hand. Secondary data was used to establish the already existing statistic on utilization of SFT and other HIS. The selection of the variables used in the study was also informed by the secondary information retrieved from the literature reviewed. Primary data collection entailed multiple data collection techniques, both of qualitative and quantitative nature as elaborated below.

3.7.1 Key Informant Interviews (KII)

Qualitative data on assessment of the barriers to utilization of the SFT, user acceptability and satisfaction with SFT in health facilities within Homabay County were collected from SFT program officer. In addition to that, management of the health facility and Homa Bay County ministry of health officers were also interviewed to enhance a deeper understanding of use of SFT and challenges facing its use. Management of the hospital, Homa Bay ministry of the health officers and SFT program officer were considered as Key informants in this study. The study conducted 12 key informants' interviews and the study used a guide to help ensure that all participants are asked the same questions in a consistent manner and enables the researcher to focus on the research objectives. The study used a tape recorder to record the interview session. KII guide is as shown in APPENDIX C.

3.7.2 Health facility-based interviews

Structured questionnaire (APPENDIX B) was used to collect quantitative data among 127 health care providers by conducting hospital-based interviews; this helped in attaining information on their opinions and views on use of SFT, and challenges facing its utilization. Structured questionnaires were used to collect quantitative data from health service providers.

3.7.3 Focus Group Discussions (FGDs)

A total of two focused group discussions were conducted, each having six health care workers. Only individuals who were not part of hospital-based quantitative interviews were invited for FGD. A discussion guide was developed for use in FGDs; which captured several themes related

to issues that are not fully explored through the survey questionnaire. These captured the extent of use of SFT among health care workers, challenges associated with its use and user acceptability and satisfaction with SFT. The FGD guide is shown is APPENDIX D.

3.8 Validity and reliability

3.8.1 Validity

Instrument validity is said to be high if the instrument can measure elements that it intends to measure with the highest precision. In research, validity is the attachment both in trust, utility and dependability that the researcher, target respondents, policymakers and other interested parties place on the data collection instruments. It's away for evaluating the content, quality and acceptability of the research work (Merriam, 1998). Both content and internal validity were validated by research experts and allocated research supervisors by strictly following institutional research thesis format, where elements, skills and behaviours' in the study were effectively measured (Golafshani, 2003; M. Saunders *et al.*, 2009).

The validity of the instrument was also be ensured by using a high-quality method and measurement technique aiming at answering the study objectives. The methods and measurement techniques were thoroughly researched based on the available literature. What to include in the questionnaire was informed by available theories and findings from other studies.

3.8.2 Reliability of the instrument

Reliability is the extent to which a measurement of a phenomenon provides accurate, repeatable, stable and consistent results overtime (Golafshani, 2003). Testing of reliability provided and ensured consistency of results in all parts of a research instrument(Torgerson *et al.*, 2009). A research instrument is said to be highly reliable if the items of the scale are stable and consistent and can yield the same construct parameters over time.

To ensure the internal consistency of instrument reliability, the Cronbach Alpha coefficient approach was adopted (Haroz *et al.*, 2014). To ensure the reliability of the research instrument, test re-test method was used on data from a pilot study conducted in 10 health facilities in Migori County who have adopted the SFT. Migori County is adjacent to Homabay County and is easily accessed through Homabay County. A pilot study is useful since it helps to establish whether the research techniques and instruments are effective and could help to uncover internal variability,

hence making the instrument more objective (M. N. Saunders & Thornhill, 2011). For cross-sectional studies, descriptive, exploratory or pilot studies; reliability of the data collection instrument should equal to or more than 0.6 (Straub, Boudreau, & Gefen, 2004), excellent reliability, 0.90 and above, high reliability, 0.70-0.90, moderate reliability, 0.50-0.70 and low reliability, 0.50 and below are other levels of reliability on a research instrument (Hinton *et al.*, 2004).

3.8.3 Reliability

The results of reliability test showed that Cronbach's Alpha had all the variable parameters above the minimum permissible alpha coefficient 0.7, which indicated good internal consistency. All items measuring effectiveness and Reliability of SFT, compatibility between SFT and HCW's tasks, ICT support for information exchange, communication, and collaboration in the health facility, and acceptability and satisfaction with SFT were acknowledged on the basis of the test and considered for the research. The closer Cronbach's Alpha coefficient is to one, the stronger the reliability (Creswell, 2013).

Table 2. 1. Reliability test result

Variables	Cronbach's Alpha	Number of Items	Comments
Effectiveness and Reliability of Scan Form Technology	0.9481	12	Highly reliable
Compatibility between scan form technology and health care workers' tasks	0.9687	8	Highly reliable
ICT support for information exchange, communication, and collaboration in the health facility	0.8530	9	Highly reliable
Acceptability and satisfaction with scan form technology in Homabay County among health care workers	0.8042	11	Highly reliable

3.9 Data collection

Primary data were collected through the administration of questionnaires to health care workers. A Pilot study was first carried out to test the validity and reliability of the research instruments in ten health facilities in Migori County that have adopted the use of SFT.

3.10 Quantitative data analysis

Descriptive data were summarized into graphs, charts, and tables using Microsoft Excel and Microsoft Power BI. This made it possible for this study to use a numerical measure to give a clear

illustration of the features of a set of data. Patterns among data were then identified to make sense of the data.

Inferential analysis tests included chi-square tests and logit regression analysis. Logic regression analysis was used to examine the relationship between independent variables (Effectiveness and reliability of SFT, compatibility of the SFT and health care workers' tasks, ICT support in information exchange, communication and collaboration) and dependent variables (Utilization of SFT among health care workers). Chi-square test was then used to test significance within a sample and then make predictions on how those variables related to a larger population. Probability values of $P< 0.05$ were considered significant. SPSS software (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) was used for statistical analysis.

Data collected was analysed in comparative bar graphs and pie charts to enable comparison and to give a clear visualization impression of varying components. The quantitative data analysis plan is as shown in Appendix F.

3.11 Qualitative data analysis

The qualitative data analysis of this study involved the use of the NVIVO software, which is a commonly used software for qualitative analysis. The study used both key informant interviews (KII) and focus group discussions (FGDs) as data collection methods. The KIIs were conducted with respondents who were knowledgeable and experienced in the use of scan form technology. The FGDs were conducted with healthcare workers from different levels of the healthcare system who were using the scan form technology in their day-to-day activities. The KIIs and FGDs were recorded, transcribed, and imported into the NVIVO software for analysis. The analysis was conducted using a thematic approach, which involved identifying and coding themes that emerged from the data. The themes were then categorized into broader themes and sub-themes.

The analysis involved multiple stages, starting with familiarization with the data, followed by coding, categorizing, and refining the themes until a final set of themes was agreed upon. The analysis was conducted by two independent analysts, who worked collaboratively to ensure consistency and reliability of the findings. Ethical considerations were taken into account during the analysis process to ensure the confidentiality and anonymity of the participants. The data

collected were only accessed by the researchers involved in the study, and the findings were presented in a way that did not identify any individual participant.

3.12 Ethical considerations

This research was conducted with full adherence to ethical principles. The study received clearance from the Jaramogi Oginga Odinga University of Science and Technology (JOOUST) Board of Postgraduate Studies and was approved by the JOOUST Ethical Review Committee (ERC) (APPENDIX I). The study also obtained approval from the National Commission for Science, Technology and Innovation (NACOSTI) in compliance with the Kenyan regulations for conducting research (APPENDIX J). Permission was granted from the Homabay county, department of health on data collection among the 54 health facilities in Homa Bay Township Sub County and Rachuonyo Sub County before the commencement of the study.

All participants in the study provided informed consent before participating (APPENDIX A). The participants were informed of the study's objectives, procedures, potential risks, and benefits. They were also informed that participation in the study was voluntary, and they could withdraw at any time without consequence. The participants were assured that their participation or refusal to participate would not affect their employment status, job security, or access to health services. The study ensured that participants were not coerced into participating and that confidentiality was maintained throughout the study. All data collected from the participants were kept confidential and used solely for research purposes. The research team ensured that participant data was anonymized, and that no individual could be identified from the study's findings. The data collected was kept secure and only accessed by the research team.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter presents study results which have been analysed and interpreted in line with the objectives of the study. The first section is on the demographic characteristics of respondents, the second section presents tests of statistical assumptions and analysis of the Likert- type of data, the third section is about analysis, presentation, and interpretation. Descriptive analysis was first done for each research objective and results were presented using mean, standard deviation, and percentages. It was then followed by inferential analysis by use of Logit Regression Analysis.

4.1. Response rate

Out of the 127 questionnaires administered to health care workers, 127 were registered for data analysis, which translates to 100% response rate. The high response rate observed was attributed to direct administration of questionnaires to the respondents by the researcher. The researcher also told the participants beforehand of the purpose of the study and sent reminders afterwards to encourage participation. The questionnaires were also clear, simple enough for respondents who were assured that the collected data was confidential.

4.2 Socio-demographic characteristics of the study participants (N=127)

A total of 127 participants were included in the study. The distribution of participants' characteristics by use of SFT is shown in Table 4.1. Most health care workers interviewed were nurses (50.39%, n=64) followed by health records officers (26.77%, n=34). Considering education level, majority of the study participants had diploma certificates (85.83%, n=109). The participant's ages were categorised into 21-30 years (40.16%, n=51), 31-40 years (42.52%, n=54), and 41-50 years (11.81%, n=15) and above 50 years (5.52%, n=7). Males were 46.46 % (n=59) and females were 53.54 % (n=68). Statistically significant associations were observed between participants' age (p=0.001), religion (p=0.019) and use of SFT. No statistically significant associations were observed between participants' cadre, level of education, gender, and use of SFT.

Table 4. 1. Socio-demographic characteristics of the participants

Variable	Attribute	n (%)	USE SFT		P-value
			No n (%)	Yes n (%)	
Cadre	General doctors	2(1.57)	1(50)	1(50)	0.327
	Nurses	64(50.39)	10(15.63)	54(84.37)	
	Pharmacist/ Pharm technologists	7(5.51)	2(28.57)	5(71.43)	
	Laboratory technicians	7(5.51)	2(28.57)	5(71.43)	
	Clinical officers	13(10.24)	1(7.69)	12(92.31)	
	Health records officers	34(26.77)	4(11.76)	30(88.24)	
Level of education	Diploma Level	109(85.83)	18(16.51)	91(83.49)	0.714
	Bachelors Level	15(11.81)	2(13.33)	13(86.67)	
	Post graduate level	3(2.36)	0(0)	3(100)	
Age	21-30 Years	51(40.16)	12(23.53)	39(76.47)	**0.001**
	31-40 Years	54(42.52)	3(5.56)	51(94.44)	
	41-50 Years	15(11.81)	1(6.67)	14(93.33)	
	above 50 years	7(5.51)	4(57.14)	3(42.86)	
Gender	Male	59(46.46)	12(20.34)	47(79.66)	0.186
	Female	68(53.54)	8(11.76)	60(88.24)	
Religion	Catholic	35(27.56)	7(20)	28(80)	**0.019**
	Protestant	87(68.5)	10(11.49)	77(88.51)	
	Muslim	5(3.94)	3(60)	2(40)	

Note: Significant at the 0.05 level, Pearson's chi-squared or Fisher's exact test were used to test the association between the participants characteristics and use of SFT. Fisher's exact test was used when expected cell frequencies are less than 5 while Pearson's chi-squared test was used when cell frequencies were greater than or equal to 5.

4.3 Health workers' experience, training, and opinion on SFT

Table 4.2 shows that many of the study participants had smart phones (n=113, 88.98%), and 59.84% were highly skilled in using mobile application. Most of the study participants reported that they had 7 to 11 months (n=47, 37.01%) of experience in using SFT. More than a half (n=68, 53.54%) of the study participants mentioned that they had adequate training and skills on use of SFT. Only 58(45.67%) respondents mentioned that their health facility had a staff on standby to support on SFT. According to the majority of the respondents (n=93, 73.23%), SFT has improved health care service delivery. The result also shows that there is statistically significant association between owning a smartphone ($p<0.001$), skills in using mobile application ($p<0.001$), duration of experience using SFT ($p<0.001$), training and skills on SFT ($p=0.001$), availability of staff on standby to support on SFT ($p=0.024$), positive attitude towards SFT ($p=0.008$), and use of SFT.

Table 4. 2. Health workers' experience, training, and opinion on SFT

Variables	n (%)	USE SFT		P-value
		No n (%)	Yes n (%)	
Own a smart phone	113(88.98)	11(9.73)	102(90.27)	**<0.001**
Rate your skills in the use of mobile application				
Highly skilled	76(59.84)	4(5.26)	72(94.74)	**<0.001**
Intermediate	43(33.86)	12(27.91)	31(72.09)	
Novice	2(1.57)	2(100)	0(0)	
Not sure	6(4.72)	2(33.33)	4(66.67)	
Duration of experience using SFT				
Less than a month	18(14.17)	15(83.33)	3(16.67)	**<0.001**
2-6 months	28(22.05)	0(0)	28(100)	
7-11 months	47(37.01)	4(8.51)	43(91.49)	
1-2 years	33(25.98)	1(3.03)	32(96.97)	
3-5 years	1(0.79)	0(0)	1(100)	
Have adequate training and skills on SFT	68(53.54)	4(5.88)	64(94.12)	**0.001**
Staff/officer on standby to support on SFT	58(45.67)	4(6.9)	54(93.1)	**0.024**
Adoption of SFT has improved health care service delivery	93(73.23)	10(10.75)	83(89.25)	**0.008**

Note: Significant at the 0.05 level, Pearson's chi-squared or Fisher's exact test were used to test the association between the participants characteristics and use of SFT. Fisher's exact test was used when expected cell frequencies are less than 5 while Pearson's chi-squared test was used when cell frequencies were greater than or equal to 5.

4.4 Instances SFT is used to capture health information in the health facilities in Homa Bay County

The result in table 4.3 indicated that 87.4%(n=111) of the study participants used SFT in recording patients' demographics, 41.73%(n=53) used SFT to capture physician notes, 44.09% (n=56) used

SFT to record nursing assessments, 36.22% (n=46) used SFT to capture problem list, 64.57% (n=82) used SFT to capture medication lists, and 25.98%(n=33) used SFT to record discharge summaries.

Table 4. 3. Instances SFT was used in Homa Bay County Facilities

Variables	n(%)
Use SFT to record patient demographics	111(87.4)
Use SFT to capture physician notes	53(41.73)
Use SFT to record nursing assessments	56(44.09)
Use SFT to capture problem lists	46(36.22)
Use SFT to capture medication lists	82(64.57)
Use SFT to record discharge summaries	33(25.98)

4.5 Extent of use of SFT by health care workers in Homa Bay County

According to the result, the majority (84.25%, CI: 76.73,89.67) of health care workers have used SFT to capture information in a health care system.

4.5.1 Frequency of SFT use by healthcare workers in Homa Bay County

Figure 4.2 shows the frequency of SFT use among health care workers in Homabay County. More than a half of health care workers always 58.3% (n=74) used SFT, 23.6 %(n=30) sometimes used SFT, 4.7% (n=6) rarely used SFT, 7.1%(n=9) never used SFT, and 6.3%(n=8) were not sure whether they ever used SFT.

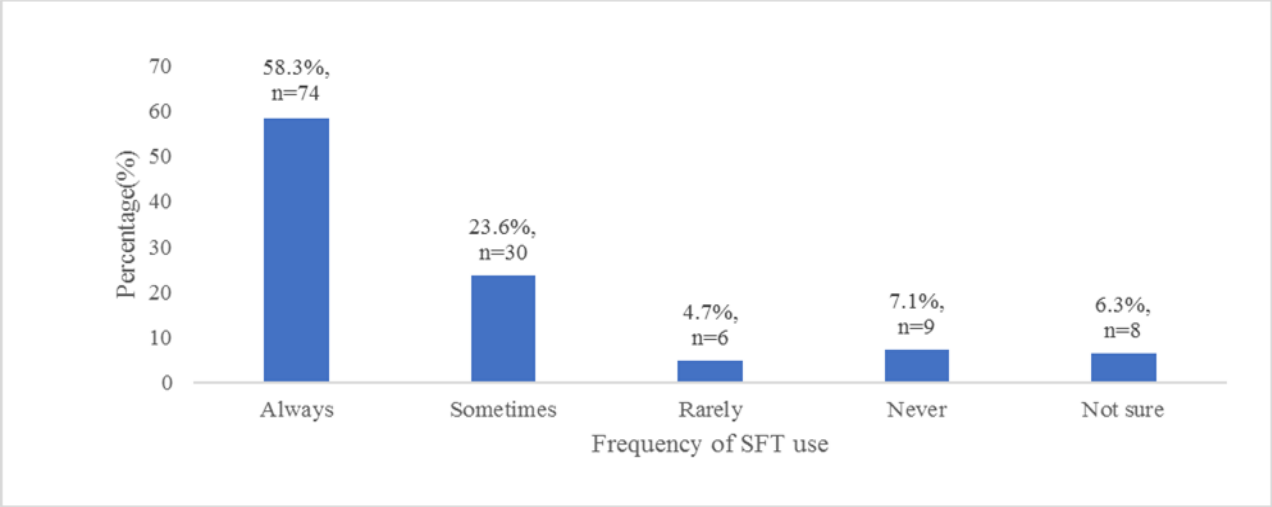

Figure 4. 1. Frequency of SFT use by health care workers in Homabay County

4.5.2 Utilization of SFT

According to the findings of the KIIs and FGDs, majority of the public health facilities had adopted the use of scan form technology. However, some health facilities, had not been fully implemented or not adopted while some facilities are not used in all departments.

"It has been adopted in facilities that were targeted" [KII]

"It's adopted in my organization" [KII]

"Yes, it has been adopted" [FGD]

Theme	Sub-theme	KII References	FGD References
Utilization	Adoptability	Yes Not fully implemented No It has been adopted in some facilities	Yes It is not used in all department facilities

4.6 Barriers to the utilization of the SFT in Homa Bay County

4.6.1 Effectiveness and reliability of SFT

4.6.1.1 Descriptive statistic: Effectiveness and reliability of SFT

Table 4.4 presents result for assessment measuring participants' perceptions of the effectiveness and reliability of scan form technology (SFT). Each statement in the table was measured on a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The mean score and standard deviation (SD) for each statement were provided, along with a corresponding interpretation of the mean score as Agree, Neutral, or Disagree.

According to the results, participants generally agreed that SFT provides support for decision making, a proper summary view, and easy access to information. Participants were also positive about the potential of SFT to improve health outcomes. However, participants expressed a neutral stance towards several variables related to usability and technical issues, such as too long-time logging in, technical problems and time wastage, easily getting help, and SFT interrupted by power shortage. Variables related to the reliability and safety of SFT, such as SFT being stable and reliable and data scanned disappearing from the server, also received a neutral response from participants.

Table 4. 4. Effectiveness and reliability of SFT

Variable	Mean (SD)	Mean Interpretation
SFT provide support for decision making	4(1.1)	Agree
SFT provides proper summary view	4(1.1)	Agree
Too long-time logging in	3(1.3)	Neutral
SFT is stable and reliable	3(1.1)	Neutral
Data scanned disappear from the server	3(1.3)	Neutral
Information from SFT easily accessed	4(1.2)	Agree
Easily get help	3(1.2)	Neutral
Technical problems and time wastage	3(1.3)	Neutral
Loss of patients' information	3(1.4)	Neutral
Incorrect functionality has or nearly caused medication errors	3(1.4)	Neutral
SFT improve health outcome	4(1.2)	Agree
SFT interrupted power shortage	3(1.4)	Neutral

Note: SD-Standard deviation,

4.6.1.2 Effectiveness and reliability of SFT and Utilization

A bivariable logit regression model was used to assess the association between each of the statements (variables) assessing the effectiveness and reliability of SFT and utilization of SFT. Table 4.5 shows the result from the bivariable logit regression analysis. Health care workers who agreed that SFT improve health outcome were more likely (Coeff=0.43, CI: [0.04, 0.83], P=0.033) to use SFT compared to those who disagreed. Health workers who reported an episode where SFT has or nearly caused medication errors were less likely (Coeff=-0.51, CI: [-0.88, -0.14], p=0.007) to use SFT compared to health care workers who did not report any case where incorrect functionality of SFT had or nearly caused medication errors.

Table 4. 5. Regressing SFT Statements on Effectiveness, Reliability, and Utilization

Variable	Unadjusted Coefficient (95% CI)	P-Value
SFT provide support for decision making	0.4(-0.02,0.82)	0.06
SFT provides proper summary view	0.22(-0.18,0.63)	0.283
Too long-time logging in	0.12(-0.24,0.49)	0.502
SFT is stable and reliable	0.33(-0.11,0.77)	0.145
Data scanned disappear from the server	-0.03(-0.38,0.32)	0.874
Information from SFT easily accessed	0.36(-0.03,0.75)	0.073
Easily get help	0.16(-0.21,0.54)	0.394
Technical problems and time wastage	-0.29(-0.66,0.08)	0.128
Loss of patients' information	-0.07(-0.43,0.29)	0.703
Incorrect functionality has or nearly caused medication errors	-0.51(-0.88, -0.14)	**0.007**
SFT improve health outcome	0.43(0.04,0.83)	**0.033**
SFT interrupted power shortage	-0.17(-0.52,0.18)	0.348

Note: CI-Confidence interval, SD-Standard deviation, Significant at the 0.05 level, p-value-probability value, Bivariable Logit regression analysis was used test the association between each variable and use of SFT

4.6.2 Compatibility between SFT and health care workers' tasks

4.6.2.1 Descriptive statistic: Compatibility between SFT and health care workers

Table 4.6 provides descriptive statistic of assessment measuring the compatibility between scan form technology (SFT) and healthcare workers' tasks. The variables in the table were measured on a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with mean scores and standard deviations (SD) provided for each variable, along with a corresponding interpretation of the mean score as Agree, Neutral, or Disagree.

According to the results, healthcare workers generally agreed that tasks performed in a straightforward manner, and that it was easy to manage patient information with SFT. They also agreed that SFT responded quickly, provided appropriate feedback, had clear concepts, was easy to learn and use, and did not require long training. In addition, participants also agreed that SFT required a fixed sequence of tasks. Overall, these results suggest that healthcare workers perceived SFT as compatible with their tasks, finding it easy to use, efficient, and providing appropriate feedback.

Table 4. 6. Compatibility between SFT and health care workers' tasks

Variable	Mean (SD)	Mean Interpretation
Tasks performed in a straightforward manner	4(1.1)	Agree
With SFT it's easy to manage patient information	4(1.0)	Agree
SFT responds quickly	4(1.0)	Agree
SFT provides appropriate feedback	4(1.0)	Agree
SFT concepts are clear	4(1.1)	Agree
Easy to learn and use SFT	4(1.0)	Agree
SFT not require long training	4(1.2)	Agree
SFT requires a fixed sequence of tasks	3(1.1)	Agree

Note: SD-Standard deviation

4.6.2.2 Compatibility between SFT and health care workers and utilization

The result from bivariable logit regression model in Table 4.7 shows that health care workers who agreed that SFT preforms tasks in a straightforward manner (Coeff=0.7, CI:[0.25,1.15], p=0.002), makes it easy to manage patients' information (Coeff=0.64,CI:[0.16,1.12], p=0.009), provides appropriate feedback (Coeff=0.96,CI:[0.4,1.53], p=0.001), has a clear concept (Coeff=0.46, CI:[0.03,0.89], p=0.037), and is easy to learn and use (Coeff=0.5, CI:[0.05,0.95], p=0.031) were more likely to use SFT compared those who disagreed.

Table 4.7. Regressing SFT Statements on Compatibility and Utilization

Variable	Unadjusted Coefficient (95% CI)	P-Value
Tasks performed in a straightforward manner	0.7(0.25,1.15)	**0.002**
With SFT it's easy to manage patient information	0.64(0.16,1.12)	**0.009**
SFT responds quickly	0.42(-0.04,0.87)	0.075
SFT provides appropriate feedback	0.96(0.4,1.53)	**0.001**
SFT concepts are clear	0.46(0.03,0.89)	**0.037**
Easy to learn and use SFT	0.5(0.05,0.95)	**0.031**
SFT not require long training	0.38(-0.02,0.78)	0.062
SFT requires a fixed sequence of tasks	0.05(-0.38,0.47)	0.822

Note: CI-Confidence interval, Significant at the 0.05 level, p-value-probability value, Bivariable Logit regression analysis was used test the association between each variable and use of SFT

4.6.3.1 ICT support for information exchange, communication, and collaboration

Table 4.8 provides descriptive statistics of assessment measuring the extent to which information and communication technology (ICT) supports information exchange, communication, and collaboration in a health facility. The variables in the table were measured on a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with mean scores and standard deviations (SD) provided for each variable, along with a corresponding interpretation of the mean score as Agree, Neutral, or Disagree.

According to the results, participants generally agreed that ICT systems in the health facility supported information exchange, communication, and collaboration. They agreed that information about laboratory results was presented in a logical format, nursing information was accessible and readable, patients' medication list was clearly presented, ICT systems supported the achievement of continuity of care, ICT systems supported collaborative collaboration between healthcare workers in the health facility, and ICT systems supported collaboration between healthcare workers and patients. However, participants had a neutral stance towards the ease of access to information about patient's medication from other health facilities, as well as the delivery of patients' information from other organizations often taking too long. In addition, participants had

a neutral stance towards the ICT system's monitoring of the use of scan form technology (SFT) in the health facility.

Overall, these results suggest that participants perceived the ICT system in the health facility as generally supportive of information exchange, communication, and collaboration, with some areas for improvement.

Table 4. 8. ICT support for information exchange, communication, and collaboration

Variable	Mean	Mean Interpretation
Information about laboratory results is presented in a logical format	4(0.9)	Agree
Nursing information is accessible and readable	4(1.0)	Agree
Patients' medication list is clearly presented	4(0.9)	Agree
Information about the patient's medication from other health facilities is easily accessible	3(1.1)	Neutral
Delivery of patients' information from other organizations often takes too long time	3(1.2)	Neutral
ICT systems support the achieving of continuity of care	4(1.0)	Agree
ICT support collaborative collaboration between health care workers in this health facility	4(1.0)	Agree
ICT system monitors the use of SFT in this health facility	3(1.1)	Neutral
ICT system support collaboration between health care workers and patients	4(1.1)	Agree

Note: SD-Standard deviation,

4.6.3.2 ICT support for information exchange and SFT Utilization

Table 4.9 shows result from a bivariable logit regression analysis assessing the association between statements(variables) assessing effectiveness of ICT support for information exchange, communication, and collaboration in the health facility and use of SFT. According to the result, health care workers who agreed that Information about laboratory results is presented in a logical format (Coeff=0.6, CI:[0.08,1.12], p=0.024), nursing information is accessible and readable (Coeff=0.55,CI:[0.09,1.02], p=0.020), patients' medication list is clearly presented (Coeff=0.71,

CI:[0.2,1.22],p=0.006), and ICT support collaborative collaboration between health care workers in their health facility (Coeff=0.5,CI:[0.05,0.96],p=0.03), were more likely to report that they ever used SFT compared to health care workers who disagreed.

Table 4. 9. Regressing ICT Support Statements on SFT Utilization

Variable	Mean	Mean Interpretation	Unadjusted Coefficient (95% CI)	P-Value
Information about laboratory results is presented in a logical format	4(0.9)	Agree	0.6(0.08,1.12)	**0.024**
Nursing information is accessible and readable	4(1.0)	Agree	0.55(0.09,1.02)	**0.020**
Patients' medication list is clearly presented	4(0.9)	Agree	0.71(0.2,1.22)	**0.006**
Information about the patient's medication from other health facilities is easily accessible	3(1.1)	Neutral	0.32(-0.1,0.74)	0.139
Delivery of patients' information from other organizations often takes too long time	3(1.2)	Neutral	-0.15(-0.57,0.26)	0.473
ICT systems support the achieving of continuity of care	4(1.0)	Agree	0.39(-0.08,0.85)	0.105
ICT support collaborative collaboration between health care workers in this health facility	4(1.0)	Agree	0.5(0.05,0.96)	**0.030**
ICT system monitors the use of SFT in this health facility	3(1.1)	Neutral	0.16(-0.25,0.58)	0.436
ICT system support collaboration between health care workers and patients	4(1.1)	Agree	0.36(-0.06,0.78)	0.089

Note: CI-Confidence interval, Significant at the 0.05 level, p-value-probability value, Bivariable Logit regression analysis was used test the association between each variable and use of SFT

4.6.4 Factors influencing utilization of the SFT

A bivariable logit regression analysis was conducted to assess the association between each of the independent variables and utilization of SFT. Only the independent variables that had significant association with utilization of SFT at 0.05 significance level were included in the multivariable logit regression model. Then result from bivariable logit regression analysis shows that compatibility between SFT and health care workers' tasks (Coeff=1.00, CI: [0.35, 1.66],0.002), and ICT support for information exchange, communication, and collaboration in the health facility (Coeff=0.86,CI:[0.13,1.60], p=0.021) had a positive association with utilization of SFT among health care workers in Homa Bay County. However, the result from multivariable regression analysis shows that only compatibility between SFT and health care workers' tasks had statistically significant positive association (Coeff=0.89, CI:[0.06, 1.71],p=0.035) with utilization of SFT.

Table 4.10. Factors influencing utilization of the SFT

Variable	Unadjusted Coefficient (95% CI)	P-Value	Adjusted Coefficient (95% CI)	P-Value
Compatibility between SFT and health care workers' tasks	1.00(0.35, 1.66)	**0.002**	0.89(0.06, 1.71)	**0.035**
ICT support for information exchange, communication, and collaboration in the health facility	0.86(0.13, 1.60)	**0.021**	0.22(-0.76, 1.19)	0.658
Effectiveness and Reliability of SFT	0.33(-0.33, 0.99)	0.330		

Note: CI-Confidence interval, SD-Standard deviation, Significant at the 0.05 level, p-value-probability value, Bivariable Logit regression analysis and multivariable logit regression analysis were used test the association between independent variables and use of SFT

4.6.5 Barriers to the utilization of the SFT

According to the Key informant and focus group discussion findings, the challenges that were being experienced were mostly attitude from the healthcare workers, inadequate equipment for efficient reporting, lack of bundles, inadequate skills and knowledge from the healthcare workers,

poor facilitation to run the scanning activity, partial implementation and lack of timely scanning of the forms.

"Timeliness lack of timely scanning of the forms" [KII]
"Few phones for capturing data for reporting. Not all could give accurate photos" [FGD]
"Inadequate knowledge to handle feedback reports generated by the system" [FGD]
"Sometimes auto-generated reports are not well accepted by facility staffs but after you take staff through the recordings its well understood" [KII]
"A lot of rubbing, folding of the pages, careless handling of the pages leading to tear" [KII]
"Inadequate staffing and inadequate skills amongst health workers" [FGD]

Theme	KII References	FGD References
Challenges	• Partial training of health workers was done • Shortage of staffs • Not all facilities use the scan form • Financial constraints for data bundles and lack of gadgets • Attitude • Partial implementation • Delay of weekly summaries	• Few phones for scanning data • The facility stopped scanning forms • Not all staff were trained on the register • Knowledge gap • The challenge is for the few new health workers who were not trained initially • Takes a little longer time compared to other registers

4.7 User acceptability and satisfaction with SFT in Homa Bay County

4.7.1 Descriptive statistics of variables assessing acceptability and satisfaction with SFT

The study aimed to investigate acceptability and satisfaction with SFT among health care workers in Homa Bay County. On average majority of health care workers agreed that they were comfortable using SFT, they liked using SFT, is appropriate for capturing patients' information, satisfied with SFT, it should be adopted by all health facilities, makes work easier, has high quality of service from company's service providers, is a reliable health information system, and saves

time. The health care worker also agreed that they would recommend adoption of SFT and approve the use of SFT in their health facility.

Table 4. 11. SFT Acceptance and Satisfaction: Descriptive Statistics

Variable	Mean (SD)	Mean Interpretation
I am comfortable using SFT	4(1.1)	Agree
I like using SFT	4(1.0)	Agree
SFT is appropriate for capturing patients' information	4(1.0)	Agree
I am satisfied using SFT	4(1.0)	Agree
SFT should be adopted by all health facilities	4(1.0)	Agree
SFT makes my work easier	4(1.1)	Agree
In case of a change of health information system, I would recommend adoption of a SFT	4(1.0)	Agree
The scan technology has high quality of service from company's service providers.	4(1.0)	Agree
SFT is a reliable health information system	4(1.0)	Agree
SFT saves time	4(1.2)	Agree
I approve the use of SFT in this health facility	4(1.1)	Agree

4.7.2 Acceptance and satisfaction with SFT

Figure 4.3 shows that most of the health workers in Homa Bay county accepted and were satisfied with SFT (n=75, 59.1%). A small proportion of health care workers showed dissatisfaction with SFT(n=8,6.3%) and 34.6% remained neutral (n=44).

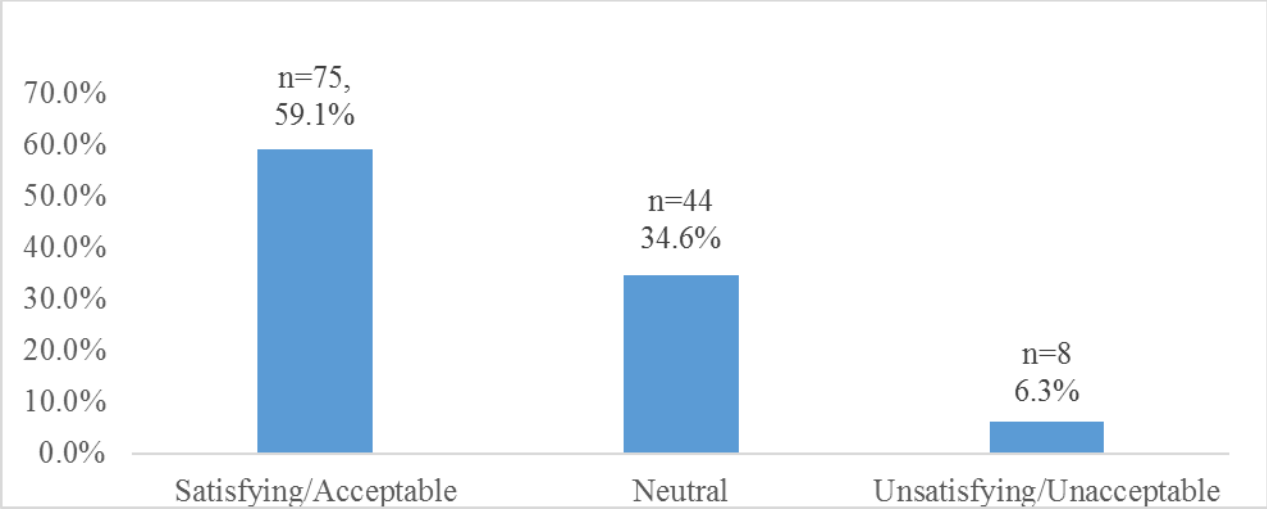

Figure 4. 2. Proportion of health care workers who were satisfied with and accepted SFT in Homa Bay County

4.7.3 User acceptance and satisfaction with SFT

The results showed that most health workers accepted the scan form technology in the health facilities and they were satisfied with the technology despite various challenges they experienced.

"*Its highly acceptable as once the data is captured and photo sent it summarizes by itself*" [KII]

"With continuous training and supervision they have accepted knowing its importance" [FGD]

"Initially it had hiccups but eventually was well appreciated" [FGD]

"Yes, most would wish it would be expanded to all service delivery points" [KII]

Some respondents felt that it was another work load and some had negative attitude towards the technology and did not embrace it.

"It varied with some health care workers championing its use while others don't embrace" [KII]

"Some health care workers think this work is extra and cumbersome" [FGD]

THEME	KII References	FGD References
Acceptability	The healthcare workers has accepted Yes but only that it's not fully implemented Highly accepted by health care workers	It was been widely accepted Was moderately accepted Yes they are satisfied

CHAPTER FIVE: DISCUSSION

The use of modern Information and Communication Technology has significantly improved patient care and information sharing among healthcare professionals across the globe. E-health programs supported by organizations like United Nations (UN), World Health Organization(WHO), Non-Governmental Organization (NGO's) and Governments have led to a successful implementation of E-health programs in developed countries (Afolayan & Oyekunle, 2014). In Kenya, with the pioneering effort of introducing the SFT in clinical settings, significant growth is anticipated to be made in encouraging health care workers to efficiently use SFT for improved information management and patients' care (QED, 2022). This study aimed to investigate the extent of use of SFT by health care workers in Homabay County. The study found that more than a half of the healthcare workers ever used SFT with majority of the users being nurses. The main uses of the SFT recorded by the health care workers included, capturing patients' demographics, physician notes, nursing assessments, problem lists, medication lists and recording discharge summaries.

These findings are consistent with other studies that have found high levels of adoption and utilization of SFT among healthcare workers. For example, a study done in United States of America found that SFT has been increasingly used among healthcare workers for data collection. The results showed that 80% of the respondents reported using scan form technology for data collection, with the most common applications being patient surveys, medical records, and clinical trials (Rothwell *et al.,* 2017). Another study conducted in Uganda by Kiberu *et al.* (2014) found that 81% of healthcare workers used SFT to record patient information, and another study in Ghana found that 87.3% of healthcare workers used SFT for patient registration and data entry(Winters *et al.*, 2016).

However, the study also revealed that some healthcare facilities had not fully implemented or adopted SFT, and some facilities did not use SFT in all departments. This suggests that there may be variability in the extent of SFT adoption and utilization across healthcare facilities. This finding is consistent with a study conducted in Nigeria that found that SFT was not fully utilized in some healthcare facilities due to a lack of training, inadequate infrastructure, and limited technical support(Akintunde *et al.*, 2016).

On the other hand, usage of SFT was commonly observed among healthcare workers who agreed that SFT makes it easy to manage patients' information, is a clear concept and is easy to learn. This concurs with other studies' findings that have shown that positive attitude influence positively utilization or adoption of a new technologies such as HMIS (Kipturgo *et al.*, 2014; Muinga *et al.*, 2020).

The study has identified several factors that hinder the utilization of the Scan Form Technology (SFT) in healthcare facilities in Homa Bay County. One of the major barriers is inadequate ICT support for information exchange, communication, and collaboration within the health facility. The modernization of Health Management Information Systems (HMIS) using Information Communication Technology (ICT) has been impeded by poor economic communication infrastructure, which has been reported as a challenge facing developing countries (Mutale *et al.*, 2013). HMIS is a crucial tool of ICT that decreases healthcare expenditure and improves healthcare delivery (Njeri, 2018). However, lack of proper ICT support has been identified as a barrier to the utilization of HMIS systems in public health facilities (Muinga *et al.*, 2020), including SFT.

Incompatibility between SFT and healthcare workers' tasks has also been identified as a significant barrier to the utilization of the technology. This finding is consistent with previous research that has shown that SFT may not be suitable for all types of data collection. Mentioning this as a limitation, the study added that SFT relies on the respondents filling in specific areas on the form. This means that the information captured by SFT is limited to the fields that are pre-defined on the form(Kane-Gill *et al.*, 2019). These use of these kinds of forms may not be applicable to all healthcare workers in a healthcare facility.

Lack of adequate training for healthcare workers on how to use SFT has been found to be another barrier to its utilization of SFT. Previous studies have highlighted the critical factors for a successful implementation of any information system in a healthcare setting, including user training and assessment of user skill (Laramee *et al.*, 2011; McAlearney *et al.*, 2012). For a successful outcome, it is important to understand healthcare workers' attitudes towards the information system and their digital literacy so that targeted training can be provided. Building user confidence and skill in ICT has been shown to improve staff engagement with the information system (McAlearney *et al.*, 2012). The result of this study has shown that inadequate staff training is a barrier to the use of SFT among healthcare workers in Homa Bay County.

Understaffing in health facilities has also been identified as a barrier to the use of SFT. Some key informants in this study cited inadequate staffing in health facilities as a significant barrier to the use of SFT. This finding suggests that understaffing affects utilization of new technologies such as SFT, which, in turn, can impact healthcare delivery. The finding of this study is consistent with other studies that have shown that understaffing is a challenge to the successful implementation of HIS such as scan form technology. A recent study conducted in Nigeria by Akintunde *et al.* (2016) specifically explored the utilization of SFT in patient data management in healthcare facilities in Nigeria. The study found that inadequate staffing in these facilities was a significant barrier to the use of SFT.

Lack of reliable internet connection has been mentioned as a barrier to the use of SFT in health facilities in Homa Bay County. Although SFT does not require persistent internet connections (QED, 2022), lack of financial support to buy internet from the local internet providers or poor internet connectivity in the rural areas of Homa Bay County can impede the use of SFT. The finding of a systematic review by Chen *et al.* (2017) in Africa, a low income setting, revealed that challenges related to availability of electricity and internet connectivity can hinder the operation and use of scan form technology.

Investigating the acceptance of new health information system applications is crucial in public health. Low acceptance can lead to interruptions and failure of successful implementation of health information systems, resulting in inefficient and inaccurate patient data management and storage. The Technology Acceptance Model (TAM) suggests that the suitability of new systems is determined by perceived ease of use and perceived usefulness (Davis, 1989). The health care workers in Homabay County indicated that SFT is useful in capturing patients' information and has increased their performance in patients' data management, thus making their work easier. Accordingly, high acceptance and satisfaction with SFT was observed among health care workers in Homabay County.

The findings of this study are consistent with previous research conducted in other countries. A study of PROMs in orthopaedics in Switzerland found that patients generally reported high levels of satisfaction with the SFT-based data collection method (Lübbeke *et al.*, 2018). Similarly, in a study of postoperative pain management in the United States, healthcare professionals found that SFT was well-received and perceived to be an efficient method for data collection (Kane-Gill *et*

al., 2019). Moreover, scan form technology is generally accepted and well-received in the African health sector. A study conducted in Ghana found that healthcare workers were generally satisfied with the use of scan forms for patient registration and perceived the technology to be reliable and efficient (Gyasi *et al.*, 2019).

Overall, the high acceptance and satisfaction with SFT observed in this study among health care workers in Homabay County is consistent with previous research in other countries, as well as in other African countries. The results suggest that SFT has the potential to improve patient data management and storage in resource-limited settings.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study findings suggest that the utilization of Scan Form Technology (SFT) was generally high among healthcare workers in Homa Bay County, primarily among nurses. SFT was predominantly used for capturing various patient information, including demographics, physician notes, nursing assessments, problem lists, medication lists, and discharge summaries. However, the implementation and adoption of SFT varied across healthcare facilities, with some not fully utilizing it or using it in all departments. The main barriers to SFT utilization were identified as inadequate ICT support and incompatibility with staff tasks. Insufficient training for healthcare workers and understaffing were additional challenges. On the other hand, healthcare workers expressed high acceptability and satisfaction with SFT, considering it useful for improving patient data management and storage, particularly in resource-limited settings.

6.2 Recommendation

In respect to the objectives and the findings discussed herein, this study recommends the following to County Government, Non-Governmental Organizations (NGOs), policy makers, ministry of health, and health care facilities' management;

1. Future research could explore the reasons for variability in utilization of SFT and identify strategies to promote more consistent adoption and utilization of SFT in healthcare facilities.
2. Healthcare facilities should conduct a needs assessment to determine the suitability of SFT for their specific data collection needs. They should also explore other information systems that may be more suitable for their tasks.
3. The government and other organizations should invest in improving the ICT infrastructure in healthcare facilities in Homa Bay County to ensure efficient information exchange, communication, and collaboration within the health facility.
4. Healthcare facilities should prioritize staff training and assessment of user skills to ensure that healthcare workers have the required digital literacy and skills to use SFT effectively.
5. The government and healthcare facilities should address the issue of understaffing to ensure that healthcare workers have enough time and resources to use SFT effectively. This

can be achieved by increasing the number of healthcare workers and providing adequate resources to support their work.

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APPENDIX A: INFORMED CONSENT

Informed Consent to Participate in a Research Study

Title of Research Project: **UTILIZATION OF THE SCAN FORM TECHNOLOGY IN HOMABAY COUNTY-KENYA**

Name of Principal Investigator: ODHIAMBO COLLINCE OCHIENG

Phone Number of Principal Investigator: +254708916406

A. PURPOSE AND BACKGROUND

ODHIAMBO COLLINCE OCHIENG, MASTER'S OF PUBLIC HEALTH STUDENT AT JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY is conducting research on the UTILIZATION OF THE SCAN FORM TECHNOLOGY IN HOMABAY COUNTY-KENYA

The purpose of your participation in this research is to help the researcher to determine factors influencing utilization of the scan form technology by health facilities in Homabay county. You were selected as a possible participant in this study because you are a health personnel with information on Health Information System.

B. PROCEDURES

If you agree to participate in this research study, the following will occur:

- You shall be issued with a questionnaire to go through
- You shall be expected to give information with regards to factors affecting use of scan form technology in your health facility (duty station)
- The process shall take averagely 30 minutes
- Data collection method shall be written (answering questionnaire questions)
- The process shall only be conducted once

C. RISKS

This study has the following risk:

- You shall be inconvenienced during this research since you shall spare your time for the research

D. CONFIDENTIALITY

The records from this study will be kept as confidential as possible. No individual identities will be used in any reports or publications resulting from the study. All questionnaires will be given codes and stored separately from any names or other direct identification of participants. Research information will be kept in locked files at all times. Only research personnel will have access to the files and questionnaires and only those with an essential need to see names or other identifying information will have access to that particular file. After the study is completed, the collected data shall be retained for 3 months awaiting destruction.

E. BENEFITS OF PARTICIPATION

There will be no direct benefit to you from participating in this research study. The anticipated benefit of your participation in this study is to determine factors influencing the utilization of the scan form technology by health facilities in Homabay County.

F. VOLUNTARY PARTICIPATION

Your decision whether or not to participate in this study is voluntary and will not affect your relationship with the MoH or your health facility. If you choose to participate in this study, you can withdraw your consent and discontinue participation at any time without prejudice.

G. QUESTIONS

If you have any questions about the study, please contact ODHIAMBO COLLINCE OCHIENG by calling +254708916406.

CONSENT

YOU ARE MAKING A DECISION WHETHER OR NOT TO PARTICIPATE IN A RESEARCH STUDY. YOUR SIGNATURE BELOW INDICATES THAT YOU HAVE DECIDED TO PARTICIPATE IN THE STUDY AFTER READING ALL OF THE INFORMATION ABOVE AND YOU UNDERSTAND THE INFORMATION IN THIS FORM, HAVE HAD ANY

QUESTIONS ANSWERED AND HAVE RECEIVED A COPY OF THIS FORM FOR YOU TO KEEP.

Signature _____ Date _____

Research Participant

Signature _____ Date _____

Interviewer

APPENDIX B: QUESTIONNAIRE

QUANTITATIVE RESEARCH QUESTIONNAIRE

A. GENERAL DEMOGRAPHICS

RESPONDENTS INFORMATION

1. Position/Cadre (Tick One)

a) General doctor [ ] b) Nurse [ ] c) Pharmacist/ Pharm technologist [ ]
d) Laboratory technician [ ] e) Clinical officer [ ] e) Health Records [ ]

g) Other (specify) ……

2. Level of education:

   Diploma Level [ ]

   Bachelors Level [ ]

   Post graduate level [ ]

   Other (Specify)……

3. Participant Age: 21 - 30 years [ ] 31 - 40 years [ ] 41 - 50 years 51 years and above
4. Gender: Male [ ] Female [ ]
5. Religion:

   Catholic [ ]

   Protestant [ ]

   Muslim [ ]

   Other (Specify)……

FACILITY INFORMATION

County: …… Sub-County: ……

Facility Name: …… Facility Level: ……

B. Utilization, Experience, and training on the use of scan form technology

1. Do this this facility use scan form technology to capture health information?

Yes [ ]

No [ ]

2. Name other health information systems used in this health facility

Scan form technology [ ]

openEHR [ ]

DHIS 2 [ ]

KenyaEMR [ ]

Basic Laboratory Information System (BLIS) [ ]

Others specify …….

3. Have you ever used scan form technology to capture health information in this health facility?

Yes [ ]

No [ ]

4. In what occasions do you use scan form technology to capture health information in this health facility? (tick all that apply)

To record patient demographics [ ]

To capture physician notes [ ]

To record nursing assessments [ ]

To capture problem lists [ ]

To capture medication lists [ ]

To record discharge summaries [ ]

Others specify …….

5. How frequent do you use scan form technology in this health facility?

Always [ ]

Sometimes [ ]

Rarely [ ]

never [ ]

Not sure [ ]

6. How do you rate the adoption of scan form technology in this health facility?

Fully adopted [ ]

Partially adopted [ ]

Not adopted at all [ ]

Don't know [ ]

7. How do you rate the acceptance of scan form technology among health care workers in this health facility?

Highly accepted [ ]

Lowly accepted [ ]

Not accepted at all [ ]

Don't know [ ]

*Now I am going to ask you about your experience and training on scan form technology (**the interviewer should notify the respondent about the next questions he is about ask**)*

8. Do you own a smart phone?

Yes [ ]

No [ ]

9. How do you rate your skills in the use of mobile application?

Highly skilled [ ]

Intermediate [ ]

Novice [ ]

Not sure [ ]

10. Did you receive pre-use/basic training on scan form technology?

Yes [ ]

No [ ]

11. What duration of experience do you have using scan form technology?

Less than a month

2 - 6 months

6 - 12 months

1 - 2 years

3 - 5 years

More than 5years

12. Have you had any in-service training on scan form technology after your basic training?

Yes [ ]

No [ ]

13. Do you feel that you have adequate training and skills on scan form technology to do your job effectively?

Yes [ ]

No [ ]

14. In which area do you feel you need more training on in order to efficiently use scan form technology? (if question 13 is No)

…….

15. What other cadres of healthcare providers use scan form technology in this facility? (Tick all that apply)

General Doctor [ ]

Nurse [ ]

Clinical officers[ ]

Pharmacist [ ]

Other (Specify)…….

16. Have other providers at this clinic received training on the use of scan form technology to capture health information?

Yes [ ]

No [ ]

Don't know [ ]

17. Is there a staff/officer on standby to support on scan form technology in case of a major complication?

Yes [ ]

No [ ]

Don't know [ ]

18. Do you think that the adoption of scan form technology has improved health care service delivery in this health facility?

Yes [ ]

No [ ]

Don’t know [ ]

B. Barriers to utilization of the scan form technology among health care workers

1. Effectiveness and Reliability of Scan Form Technology

Kindly indicate the extent to which you agree with each of the following statements as regards the adoption of scan form technology (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral 4 =Agree, 5 = Strongly Agree)

	Statement	**1**	**2**	**3**	**4**	**5**
1	Scan form technology provide support for decision making (by giving warnings and reminders)					
2	Scan form technology provides proper summary view (daily treatment chart) of patients' information					
3	Logging in several systems takes too long time					
4	The scan form technology is stable and reliable, and no system errors (for example crashes) occur when I use the technology					
5	I feel that occasionally some of the data I have scanned disappear from the server					
6	Information retrieved from registers through scan form technology is easily accessed when needed.					
7	If I have problems with scan form technology, I can easily get help or recover from the error situation					
8	A significant portion of my working time is wasted on struggling with technical problems					
9	Incorrect functionality has or nearly caused serious loss of patients' information					
10	Incorrect functionality has or nearly caused medication errors					
11	Scan form technology help to improve health outcome					
12	The use of scan form technology is sometimes interrupted due to power shortage					

2. Compatibility between scan form technology and health care workers' tasks

Kindly indicate the extent to which you agree with each of the following statements on compatibility between scan form technology and health care workers' tasks (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral 4 =Agree, 5 = Strongly Agree)

	Statement	**1**	**2**	**3**	**4**	**5**
1	Routine tasks can be performed in a straight forward manner using scan form technology					
2	I find it easy and fluent to manage patient information (document and retrieve data) using scan form technology					
3	Scan form technology responds quickly to inputs					
4	The scan form technology provides me appropriate feedback about the task it performs (e.g., when syncing data)					
5	The concepts and terms used in scan form technology are clear and unambiguous					
6	I find it easy to learn how to use scan form technology					
7	Learning the use of scan form technology does not require long training					
8	The scan form technology requires me to perform a fixed sequence of tasks					

3. ICT support for information exchange, communication and collaboration in the health facility

Kindly indicate the extent to which you agree with each of the following statements on ICT support for information exchange, communication, and collaboration (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral 4 =Agree, 5 = Strongly Agree)

	Statement	1	2	3	4	5
1	Information about laboratory results is presented in a logical format					
2	Nursing information is accessible and readable					
3	Patients' medication list is clearly presented					
4	Information about the patient's medication from other health facilities is easily accessible					
5	Delivery of patients' information from other organizations often takes too long time					
6	ICT systems support the achieving of continuity of care					
7	ICT support collaborative collaboration between health care workers in this health facility					
8	ICT system monitors the use of scan form technology in this health facility					
9	ICT system support collaboration between health care workers and patients					

C. Acceptability and satisfaction with scan form technology in Homabay County among health care workers

Kindly indicate the extent to which you agree with each of the following statements on acceptability and satisfaction with scan form technology (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral 4 =Agree, 5 = Strongly Agree)

	Statement	1	2	3	4	5
1	I am comfortable using scan form technology					
2	I like using scan form technology					
3	Scan form technology is appropriate for capturing patients' information					
4	I am satisfied using scan form technology					
5	Scan form technology should be adopted by all health facilities					
6	Scan form technology makes my work easier					
7	In case of a change of health information system, I would recommend adoption of a scan form technology					
8	The scan technology has high quality of service from company's service providers.					
9	Scan form technology is a reliable health information system					
10	Scan form technology saves time					
11	I approve the use of scan form technology in this health facility					

End

Thank the respondents for his/her time

APPENDIX C: KEY INFORMANT INTERVIEW GUIDE

A guide for program officers and health facilities' managers in the study

Thank you for agreeing to participate in this interview today. As a research assistant working on a study titled "UTILIZATION OF THE SCAN FORM TECHNOLOGY IN HOMABAY COUNTY – KENYA", I am very interested to hear your thoughts and opinions about the adoption of scan form technology and challenges associated with its use.

I am looking for your perspective on this subject and therefore all your responses will be very important. To obtain this information, I am going to ask you related questions and request you to answer them to the best of your knowledge.

If you do not want to answer a question, please let me know and we will move on to the next question.

This information will be confidential and will only be accessed by the authorized personnel in the study.

Do you have any questions before we begin? [Wait for any questions.] If it is ok, we will begin.

I would like to begin by talking about the extent of use of the scan form technology by health care workers in Homabay County.

1. In your own opinion, do you think the use of scan form technology has been fully implemented in public health facilities in Homabay County?
    a) What about your organization? (*Ask whether his/her organization has adopted the scan form technology*)
2. What type of information is captured by scan form technology in your organization?
3. Do you think that health care workers in your organization have appropriate training on the use of scan form technology?

    [*Probe further depending on the response given*]
    a) Who is responsible for the trainings on scan form technology?
4. Is there any cadre in particular that is more likely to use scan form technology compared to other cadres?

    Probe: why? (If a cadre is mentioned)

    [Probe further depending on the response given]

Thank you for your responses. Now I would like to hear about your opinion on barriers to utilization of the scan form technology in Homa Bay County.

5. In your opinion, what are the challenges facing the use or adoption of scan form technology in health facility within Homabay County?

[Probe further depending on the response given]

a) What about the health facility you affiliated to? (If a challenge is mentioned)

b) From the opinions expressed, what measures can be put to mitigate the challenges faced by the scan form technology? (If a challenge is mentioned)

6. What are some of the benefits linked to the use of scan form technology in public health facilities in Homabay County?

[Probe further depending on the response given]

The last few questions that I would like to ask you relate to the user's acceptability and satisfaction with scan form technology in Homa Bay County.

1. What is your opinion regarding acceptability of the scan form technology among health care workers in your organization?

[**Probe further depending on the response given]**

a) Do you express the same feelings when it comes to the acceptability of the scan form technology?

2. In your opinion, do you think the health care workers are satisfied by the use of scan form technology?

[Probe further depending on the response]

a) Has anyone ever reported anything against scan form technology to you or any other person in the management?

3. In your opinion, do you think there is possibility of health care workers not accepting or not feeling satisfied by the scan form technology now or in the future?

a) From the opinions expressed, what measures can be put to ensure that scan form technology is fully accepted by the health care workers?

That brings me to the end of the discussion I had for today, do you have any questions, concerns or comments on what we have discussed?

Thank you very much for your time and participation in the process. Your opinions and thoughts are very important in achieving the objectives of this study.

THANKS FOR YOUR PARTICIPATION

APPENDIX D: FOCUSED GROUP DISCUSION GUIDE

Thank you for agreeing to participate in this interview today. As a research assistant working on a study titled "UTILIZATION OF THE SCAN FORM TECHNOLOGY IN HOMABAY COUNTY – KENYA", I am very interested to hear your thoughts and opinions about the adoption of scan form technology and challenges associated with its use.

I am looking for your perspective on this subject and therefore all your responses will be very important. To obtain this information, I am going to ask you related questions and request you to answer them to the best of your knowledge.

If you do not want to answer a question, please let me know and we will move on to the next person.

This information will be confidential and will only be accessed by the authorized personnel in the study.

Do you have any questions before we begin? [Wait for any questions.] If it is ok, we will begin. I would like to begin by talking about the extent of use of the scan form technology by health care workers in Homabay County.

1. Could you describe what in your opinion the scan form technology is?
2. Could you describe your experience with scan for technology?
3. Could you mention persons or groups of health workers you think are particularly more likely to use the scan form technology in a health facility [**Probe: which group or person and reasons]**
4. What type of information do you capture using scan form technology in your health facility?
5. Do you think that you have appropriate training on the use of scan form technology?

   [*Probe further depending on the response given*]

   b) Who is responsible for the trainings on scan form technology?

   c) What are some of the areas you were trained on?

   [Probe further depending on the response given]

Thank you for your responses. Now I would like to hear about your opinion on barriers to utilization of the scan form technology in Homa Bay County.

6. In your opinion, what are the challenges facing the use or adoption of scan form technology in health facility within Homabay County?

[Probe on the effectiveness and reliability of scan form technology, compatibility of scan form technology and the task, ICT support, communication, and collaboration]

c) What about the health facility you affiliated to? (If a challenge is mentioned)

d) From the opinions expressed, what measures can be put to mitigate the challenges faced by the scan form technology? (If a challenge is mentioned)

7. What are some of the benefits linked to the use of scan form technology in public health facilities in Homabay County?

[Probe further depending on the response given]

The last few questions that I would like to ask you relate to the user's acceptability and satisfaction with scan form technology in Homa Bay County.

4. What is your opinion regarding acceptability of the scan form technology among health care workers in your organization?

[**Probe further depending on the response given]**

a) Do you express the same feelings when it comes to the acceptability of the scan form technology?

5. In your opinion, do you think you are satisfied by the use of scan form technology?

[Probe further depending on the response e.g., why do you think you are satisfied with the scan form technology]

a) Have you ever reported anything against scan form technology to your scan form technology service providers(qed) or any other person in the management?

6. In your opinion, do you think there is possibility of you or other health care workers not accepting or not feeling satisfied by the scan form technology now or in the future?

b) From the opinions expressed, what measures can be put to ensure that scan form technology is fully accepted by the health care workers?

That brings me to the end of the discussion I had for today, do you have any questions, concerns or comments on what we have discussed?

Thank you very much for your time and participation in the process. Your opinions and thoughts are very important in achieving the objectives of this study.

APPENDIX E: PUBLIC HEALTH FACILITIES IN RACHUONYO NORTH AND HOMABAY TOWNSHIP SUB-COUNTIES

Name of Health Facility	Level of Health Facility	Staff Distribution
ACK Otaro Community Dispensary	2	2
Adiedo Dispensary	2	2
Ager community dispensary	2	2
Alaro Community Dispensary	2	2
Chuowe Dispensary	2	2
Chuthber Dispensary	2	2
GK Prison Dispensary (Homa Bay)	2	2
Got Oyaro Dispensary	2	2
Homa Bay County Teaching and Referral Hospital	4	100
Homa Hills Health Centre	3	4
Homa Lime Health Centre	3	4
Homabay County Beyond Zero Mobile Clinic	1	1
Hope Compassionate (ACK) Dispensary	2	2
Kajieyi Dispensary	2	2
Kandiege Sub-District Hospital	3	4
Kangir Dispensary	2	2
Kendu Sub-District Hospital	4	45
Kichawa Health Center	3	4
Kijawa Dispensary	2	2
Kobuya Dispensary	2	2
Kodula Dispensary	2	2
Koduogo Dispensary	2	2
Kogweno Oriang' Dispensary	2	2
Kosele Dispensary	2	2
Lela (Community) Dispensary	2	2
Magao dispensary	2	2

Name of Health Facility	Level of Health Facility	Staff Distribution
Makongeni Health Centre	4	23
Marindi Sub County Hospital	4	29
Miniambo Dispensary	2	2
Miriu Health Centre	3	4
Ndere Dispensary	2	2
Ngeta Dispensary	2	2
Ngolo Dispensary	2	2
Nyalkinyi Health Centre	3	4
Nyamasi Dispensary	2	2
Nyangajo Dispensary	2	2
Nyaoga Community Dispensary	2	2
Ogande Dispensary	2	2
Ojunge Health Centre	3	4
Okiki Amayo Health Centre	3	4
Okita Health Center	3	4
Olando Dispensary	2	2
Omboga Dispensary	2	2
Orego Health Centre	3	4
Oriang (SDA) Health Centre	3	4
Oriwo Dispensary	2	2
Oyuma Dispensary (Rachuonyo)	2	2
Pala Dispensary	2	2
Rakwaro Dispensary	2	2
Raruowa Health Centre	3	4
Simbi Kogembo Dispensary	2	2
Wagwe Health Centre	3	4
Wiga Dispensary	2	2
Wikondiek Dispensary	2	2
TOTAL		**322**

APPENDIX F: DATA ANALYSIS PLAN

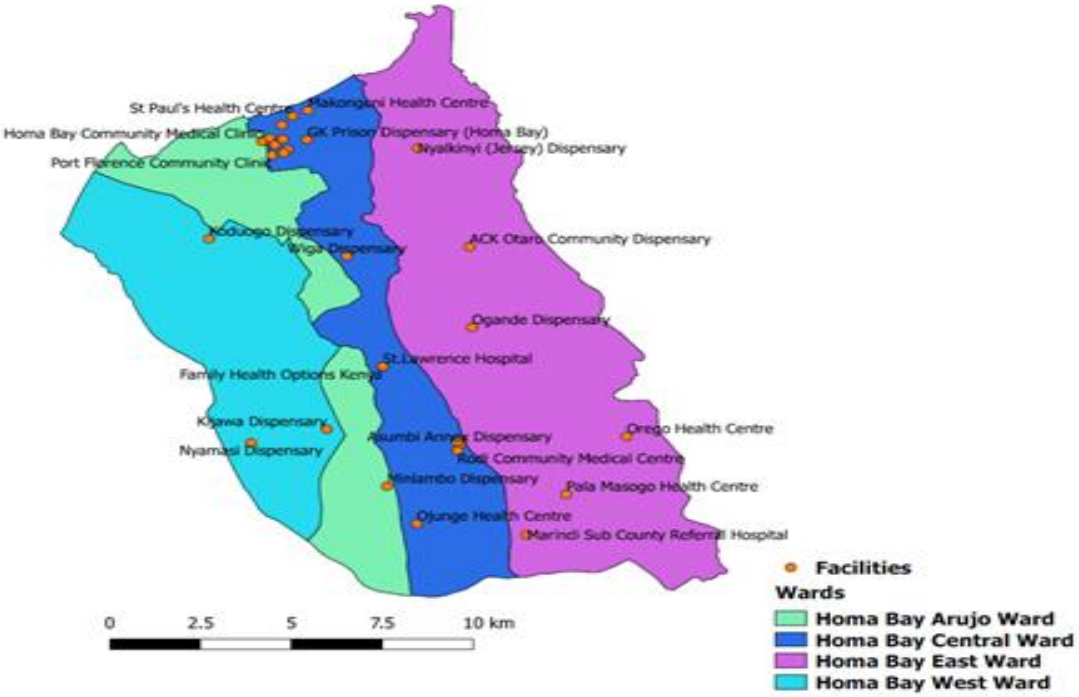
Data Analysis Plan

Objectives	**Independent variables**	**Dependent variables**	**Data Analysis process**
1. To determine the extent of use of the scan form technology by the staff in Homa Bay County.	Use of the scan form technology, frequency of utilization of scan form technology among the health care workers	Utilization of scan form technology among health care workers	**Descriptive analysis** • Crosstabulation of the variables assessing use of scan form technology and facility level presented using tables, frequencies and percentages • Proportion of respondents using scan form technology presented on pie chart
2. To establish barriers to utilization of the scan form technology in Homa Bay County.	Effectiveness and reliability of scan form technology, compatibility of the scan form technology and health care workers' tasks, ICT support in information exchange, communication and collaboration	Utilization of scan form technology among health care workers	• The independent variables were generated by finding a composite index of all the responses of statements were rated on Likert scale. • The index were then categorized into three (agree, not sure, and disagree) • Cross tabulation of dependent and the independent variables • Binary logit regression analysis was also done to assess the relationship between the independent and the dependent variable. • The result was presented using tables, coefficients and probability value and confidence interval.

Objectives	Independent variables	Dependent variables	• Data Analysis process
3. To establish the user acceptability and satisfaction with scan form technology in Homa Bay County.	I am comfortable using scan form technology, I like using scan form technology, Scan form technology is appropriate for capturing patients' information, I am satisfied using scan form technology, Scan form technology should be adopted by all health facilities, Scan form technology makes my work easier, In case of a change of health information system, I would recommend adoption of a scan form technology, The scan technology has high quality of service from company's service providers, Scan form technology is a reliable health information system, Scan form technology saves time, I approve the use of scan form technology in this health facility	User acceptability and satisfaction with scan form technology	• Descriptive analysis was conducted and the result presented into tables, frequencies, mean and standard deviation • The independent variables were generated by finding a composite index of all the responses of statements that were rated on Likert scale. • The index were then categorized into three categories (acceptable/satisfying or unacceptable/not satisfying) and the result were presented on a bar graph

APPENDIX G: MAP OF HOMA BAY TOWNSHIP SUB COUNTY

Study Location -54 Health Facilities Implementing the SFT in Homabay Township Sub County



Source: Homa Bay County Integrated Development Plan, 2013 – 2017

APPENDIX H: MAP OF RACHUONYO NORTH SUB COUNTY

Study Location -Health Facilities Implementing the SFT in Rachuonyo North Sub-County

Source: Homabay County Integrated Development Plan, 2013 – 2017

APPENDIX I: BOARD OF POSTGRADUATE STUDIES INTRODUCTORY LETTER

JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE & TECHNOLOGY

BOARD OF POSTGRADUATE STUDIES

Office of the Director

Tel. 057-2501804
Email: bps@jooust.ac.ke

P.O. BOX 210 - 40601
BONDO

Our Ref: H153/4169/2019

Date: 3rd November 2021

TO WHOM IT MAY CONCERN

RE: ODHIAMBO COLLINCE OCHIENG - H153/4169/2019

The above person is a bonafide postgraduate student of Jaramogi Oginga Odinga University of Science and Technology in the School of Health Sciences pursuing Master of Science in Epidemiology and Biostatistics. He has been authorized by the University to undertake research on the topic: ***"Uptake of the Scan Form Technology in Homabay County - Kenya".***

Any assistance accorded him shall be appreciated.

Thank you.

Prof. Dennis Ochuodho
DIRECTOR, BOARD OF POSTGRADUATE STUDIES

APPENDIX J: RESEARCH LICENCE

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 267716

Date of Issue: 21/August/2022

RESEARCH LICENSE

This is to Certify that Mr.. Collince Ochieng of Jaramogi Oginga Odinga University of Science and Technology, has been licensed to conduct research in Homabay on the topic: UPTAKE OF SCAN FORM TECHNOLOGY IN HOMABAY COUNTY for the period ending : 21/August/2023.

License No: NACOSTI/P/22/19523

267716

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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