UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING & INFORMATICS

EVALUATING THE EFFECT OF SMS TEXT REMINDERS IN ATTENDANCE OF HIV CLINIC APPOINTMENTS.

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A project proposal submitted in partial fulfillment of the requirements for the Master of Science in Information Technology Management degree at the University of Nairobi's School of Computing and Informatics.

Aug, 2021

DECLARATION

This research project is exclusive to me and has never been submitted for a degree at any university.

Signature:

Date: 21 August 2021

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P54/35505/2019

This project is submitted for examination with my approval as the University of Nairobi Supervisor.

Signed: Date: *26th August 2021*

Prof. Daniel Orwa Ochieng

ABSTRACT

Background

Missed Clinic appointments, defaulter rates, and failure show up after starting antiretroviral therapy (ART) are all normal in Africa. There are several techniques that can be used to increase clinic attendance, such as application of software that are designed to have appointment management alerts, application of automated or manual appointment systems that possess reminders. All these can be achieved through using SMS, phone calls, or emails.

Problem

Missed clinic appointments pose difficulties for healthcare staff all over the world. No-show rates for scheduled clinic appointments in healthcare settings could reach up to 42 percent globally.

Objective

The objective of this research study meant to assess the effectiveness of Short Messaging services reminders, commonly appreviated as SMS to clients of their clinic dates in reducing missed clinic appointments in HIV Clinic.

Method

A randomized control trial was conducted at HIV clinic. Clients were randomized in intervention and control group. The study deployed a stratified random sampling to achieve the outlined objectives. There was application of questionnaires that were distributed to participants as they attended their clinic appointments. Data was coded and analyzed in Excel and SPSS. Non parametric method was used because the sample size was small and data was not normally distributed.

Results

The results showed that sending reminder messages to clients to remind them of their clinic appointments increases clinic attendance rates (92%) when compared to those who were not sent reminder messages (74%). Out the reasons given for missing clinic forgetting was the highest with 44%. The results showed that that the quality of the system had a remarkable value on the application of mobile applications and also on user satisfaction. Information Quality showed that there is no significant value on the application of phone mobile, as well as in the satisfaction of users. Deployment of mobile applications often showed that there is value addition on the usage and the clients who are highly satisfied with the mobile application found value on using the application.

Limitations

The study period was short because it was only one week (7days). The questionnaires were not all filled.

Conclusion

This study showed that use of short messaging service to remind clients of their clinic appointment dates is a promising intervention that can be used to increase HIV care compliance to clinic appointments. Clinic attendance rate would be increased if Clinic adopt the use of mobile applications to send reminder messages to clients on their clinic appointments.

Value of the study

This research would inform health care providers and other stakeholders in health care settings that use of short messaging service to remind clients of their clinic appointment dates would reduce missed clinic appointments.

DEFINITION OF TERMS

Hospital- A hospital is a facility that offers medical and surgical services as well as nursing care to people who are ill or wounded.

Clinic appointment- scheduled day and time for an individual to be treated by a physician or other licensed health care professional.

Missed Clinic appointment-A clinic appointment that was not attended by a patient.

Lost to Follow up-This is a patient who has missed clinic appointment three months and above.

LIST OF ABBREVIATION AND ACRONYMS

HIV-Human Immuno-Deficiency Virus

SMS-Short messaging service

MHealth-Mobile Health

NMC-Naivasha Medical Centre

WHO-World Health Organization

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CHAPTER 1

INTRODUCTION

1.0. Background of the study

According to a 2017 International Telecommunication Union survey, there were nearly 7.7 billion cell phones in use worldwide. Furthermore, with the involvement of mobile phones, there have been several studies reporting that people have greatly been influenced by it, through how they interact and how health care providers think about service delivery (Fang et al.,2018). Non-attendance at appointments causes delays in diagnosis and treatment initiation, as well as drug dosage adjustment. There are several techniques that can be used to increase clinic attendance. Majorly, these techniques can be boosted by the application of SMS, phone calls or emails, and they include the application of appointment management or automatic or manual appointment systems.

One of preliminary study conducted in November 2014 revealed that approximately 70 HIV patients out of 307 (23%) who had been scheduled to have an outpatient appointment either in hospitals or clinic ended up not attend the appointment (Zebina et al 2019).

Missed appointments, defaulter rates, and failure familiarize with the schedules after starting antiretroviral therapy (ART) are all normal occurrences in most hospitals found across Africa. According to Teshale et al (2020), the rate forgetting to make proper follow up was found to be at the pick in most youths, laborers, and ambulatory patients.

The majority of studies concerning mobile involvement in health care has concentrated on tactics that would improve behavioral aspects and also the act of reminding

Other studies that have been on the forefont research have been the mobile communication and computer technology that especially relates to healthcare provision (Fang et al.,2018). Mobile Health apps can also help patients remember their appointments.

1.1 Problem Statement

Missed clinic appointments pose difficulties for healthcare staff all over the world. Nonattendance at clinic appointment rates was calculated by dividing the actual figure of the appointment that were not attended by the overall actual figure of appointments that were expected to be attended. No-show rates for scheduled clinic appointments in healthcare settings worldwide could reach up to 42 percent.

If health provisions manage to come up with strategy that reduces the rates of appointment that were missed, it would help in increasing the quality of preventive services provided by healthcare providers as well as patient health outcomes. The rate of missed hospital appointment would be minimized through advising those expected to turn up for their upcoming medical appointments prior to the clinic day (Joseph, et al., 2016). This research will evaluate the impact of SMS text appointment reminders in an HIV Clinic Nakuru County.

1.2 Objectives of the Research

1. In order to determine components that influence mobile application of information system access

2.To determine the effectiveness of using mobile phones in achieving health outcomes

3. To Evaluate the effectiveness of SMS reminders in reducing missed clinic appointments in HIV Clinic

1.3 Significance of the study

1.This research will inform health care providers and other stakeholders in medical settings based on the results whether there is any difference on clinic attendance between the patients who received text reminder and the control group (those who did not receive). There will be understanding of the benefits of Mobile health applications in this case short message service (SMS reminders).

3.This research will provide information on the need of more research on mobile applications in medical settings.

1.4 Scope of the Study

This study intends to be centered on patients attending clinic in the specific period of study.

All the patients who were sent SMS reminders on their clinic day for the specified period will be included and also those who were not sent the messages.

1.5 Assumptions and Limitations of the study

The assumption was that the respondents gave valid information for the study. The study period was limited.

CHAPTER 2

LITERATURE REVIEW

2.0 Overview of Missed Hospital Appointments

In 2015, the Secretary for State Healthcare in United Kingdom approximated that the healthcare department loses roughly 912 million pound a year due to cases of patients missing appointment such as those advocated by hospital and general practitioners, and that these clinic appointments were mainly missed due to forgetfulness (Shadrack et al.,2020)

According to Adel et al's research, cell phones are globally used and their application has been recognized to serve a wide range of users all social classes and ages and are almost certainly used as a means of communication in a wide variety.

Texting is most common among younger people, especially those that are document to have the highest rates of not showing up for the hospital or general practitioners' appointment. Considering the mobile phones regarded as personal devices, they help the overall medical support since they provide the privacy required for HIV and IDS patients and contribute in increasing the chance of reaching the intended individuals in a quick and direct. The study concluded that application of SMS reminders in mobile and cell phones to particular patients scheduled to have appointment in hospitals and clinics was correlated with a substantial reduction in no-show incidence, though this differed depending on clinic specialty. Because of recent technological advancements, the usage of electronic reminders has become more popular. Messaging or the text messaging has for the longest time been recognized as the mostly used means of communication and its application can manage to reach a large number of people at the same time (Adel et al., 2015)

Mobile technologies are enabling improved access to healthcare services and knowledge. The use of cell phones opens up new possibilities and capabilities for improving healthcare access and delivery. Setting up of SMS reminders are known to come along with numerous clinical advantages such as increasing the attendance of clinic (Anstey Watkins et al.,2018)

According to the WHO, commitment to care in chronic illnesses can be as poor as 50%. According to a meta-analysis of eight studies done in China, Scotland, Australia, Malaysia, Kenya and United States, revealed that only 68 percent of patients had reasonable adherence in regard to the rates of attendance as outlined in the clinic schemes of appointment (Zebina et al 2019).

The factors that influence mobile application of information accessibility associate to having quality systems that are required in the alerting process, achieving the desirable quality in service delivery, possessing the usefulness that is required, having quality of the information, and lastly perceiving ease of application (N.Aeni Hidayah, 2020).

2.0.1 Missed Appointments in Outpatient Clinics

Missed outpatient hospital appointments are a common problem, with estimates ranging from 5.4 percent to 50.2 percent. Most of the unattended appointments lead to having a detrimental effect in regard to the level of quality of life and its efficacy, through which outpatient care services are delivered. As most of the missed hospital appointment continue to merge in patient living with disease such as HIV and AIDS, it contributed in having delayed diagnosis of the next stage or any other disorder, some of the consequences can include a bad outcome and worsening disease condition. Application of SMS has the ability to meet wide number of patients and the service being conducted at a lower cost. Additionally, SMS technology has been known and applied for many years and its can be utilized in both developing and developed countries. SMS appointment

reminders have been shown in studies to be more efficacious in deducting the number of outpatients that tend to forget their appointment and it is also cost-effective in comparison to other mobile notification such as calendar marking notification (Shadrack et al., 2020).

2.0.2 Missed Appointments in Pediatrics Clinic

An analysis conducted by Chai et al using a randomization flow chart concluded that nonattendance was substantially lower in the intervention group (23.5 percent) than in the control group (38.1 percent), reflecting a 14.6 percent gap. According to the report's results, sending short message service updates about clinic appointments is a good strategy to boost attendance at an urban clinic especially the pediatric resident ones that have severally registered a number of nonattendance rate (Chai et al.,2016).

According to the findings of Haji (2016) report on reducing vaccine dropout rates, he found out that the comparison of vaccination coverage between using control group was lower as SMS intervention was higher in regard to meeting the set expectations. The extensive use of text message reminders in regular immunization programs in Kenya had been endorsed.

2.0.3 Missed Appointments in HIV Clinics

HIV Prevalence in Kenya is 5.6% and Nakuru County stands at 3.0 %. (KEPHIA 2018 Preliminary report).

People living with HIV and AIDS who attend clinic appointments on a regular basis and stick to the form of treatment contribute in having an essential overall outcome that facilitate easy health management and the overall outcome. Most medics emphasis that patients diagnosed to be living with HIV and Aids need to adhere to every medical appointment and uphold the right

expectations of the treatment since they are very crucial caring components and they help in exceeding and increasing the normal lifespan as well as its quality

Where there is lack of good compliance with clinical appointment and cases of having irregular therapy sessions are likely to contribute in viral resistance, complications related to AIDS and cases of medication failure. Patients' attendance rates at outpatient appointments have been improved using a variety of approaches in health care environments; This involves handing out reminder cards to HIV and Aids during their appointment sessions (clinic cards), making call that act as reminder, and, which has been the most recent case is the sending of texts that remind HIV and AIDS to take medication or even emails (Nishal et al 2019).

In recent years, mobile phones have evolved dramatically in modern technology around the world (Nishal, et al., 2019). According to the findings of Nishal et al's report, recorded that most of the patients who manage to attend consecutive appointments have been alerted by the mobile text. Additionally, Nishal, et al., (2019) found out that at Ryan White-funded HIV treatment clinic which had successfully implemented the text massage based form of alert helped in lowering the overall percentage of missed cases of appointment.

2.1 Electronic Clinical Records Systems

Electronic Clinical Records Information System (ECR) has improved in the management of healthcare services. With the large volume of data being produced by clinics, the need of capturing that data electronically would ease their work tremendously. The electronic clinical record (ECR) is a method of storing clinical data in an electronic format (Nisar and Said, 2011). Most ECR are developed by reflecting to what the paper-based system looks like accumulating all the information. Information collected includes demographic information, such as personal

Information for identifying the client, allergies, diagnoses and treatment or medicine. This information can be used in several areas for different purposes.

Electronic Patient Records (EPR)

EPR is an electronic record of a single individual's continuous health care, mostly delivered by one agency, i.e., more patient-centric. Because of their limitations, most EPR devices are not used in hospitals.

Electronic Medical Records (EMR)

The term EMR refers to an electronic version of a paper-based clinic record that contains a patient's medical and treatment history.

This expertise is handled and consulted by a particular agency such as professional medical and administrative personnel who are concerned with the individual's health and care. EMR is known to be a subset of Electonic Health Records (EHRs).

Electronic Health Records (EHR)

EHR is a continuous of health recording of a patient that is done continuously and is managed to be generated by one or more encounters in every clinical visit – from birth to death. A patient's diagnosis, vital signs, problems, previous medical history, demographics, progress details, prescriptions, test results, radiology reports, and immunizations are among the data collected. The EHR will create a complete record of a patient experience, as well as provide evidence-based decision support and results reporting. It focuses on the patient's overall wellbeing, as it contains knowledge from all doctors with whom the patient communicates (data exchange between physicians).

Case summaries of Electronic Health Records

In August 2011, the National AIDS and STD Control Programme (NASCOP) conducted a study of Kenya's EMR systems in order to standardize them. EMR's in Kenya (NASCOP, 2011). They reviewed different EMR's as indicated below:

Case Study 1: OpenMRS

The EMR is mainly used in Lumumba Health Center, Rabuor Health Center, Busia District Hospital and Moi Teaching and Referral Hospital just to name a few. OpenMRS was created by a global group of volunteers from various backgrounds, including technology, health care, and international development, who worked together to create the world's largest and most scalable technology platform to support health care delivery in some of the most difficult environments on the planet (OpenMRS, 2013). It was created as a stand-alone framework using a Java-based web application. In the practical areas of basic demographics and interoperability, OpenMRS received ratings of 76.2 percent - 95.2% and 42.5 percent - 95.2%, respectively.

Case Study 2: IQCare

IQCare is a data collection and monitoring system with patient management software that can measure patient outcomes, interpret data, and use the results to provide better care (FuturesGroup, 2010). IQCare retains data consistency dimensions. It was created as a stand-alone framework in Microsoft Access. IQCare received 85.7 percent and 90.3 percent in the practical field of basic demographics, respectively.

Case Study 3: EDARP HMIS

The EMR is mostly used in clinics operated by the Eastern Deanery AIDS Relief Program (EDARP). EDARP HMIS was created internally by EDARP's HMIS department to assist with

their HIV treatment programs. It facilitates clinical care and long-term patient follow-up, including appointment scheduling; it stores prescription and investigation data and produces reports. It was created as a stand-alone framework with MS SQL as the backend and the VB.net programming language as the frontend. In the practical areas of basic demographics and interoperability, EDARP HMIS received 47.6 percent and 14.3 percent, respectively.

Case study 4: Kenya EMR

Kenya EMR is a modified version of Open Medical Record System (OpenMRS), an open source EHR system commonly used to support HIV/AIDS patient management in many African countries (as well as other diseases such as tuberculosis and noncommunicable diseases).

Open MRS was designed to avail a key application as well as a number of plug-in modules that could be used to develop clinical health information systems. The KenyaEMR framework was created in response to the ESG report's requirements and is now in operation in over 300 facilities across Kenya, with the help of the International Training and Education Center for Health at the University of Washington (ITECH Kenya). ITECH Kenya also encourages users to deploy the system by providing comprehensive capacity building through facility-based champion mentors.

2.1 Theoretical Framework

2.1.1 DeLone and McLean of Information Systems Success

"Service quality" was introduced to represent the significance of service and help in creating an effective e-commerce system; "intention to use" was included as an alternative measure of "use"; and "individual effect" and "organizational impact" were merged into the "net benefits" construct. The updated model incorporates six linked aspects of information system success: device and service efficiency, expertise, (intention to) use, happiness of the user, and net benefits. Following is how the model can be interpreted: It is possible to assess the information, device, and service quality of a system. These characteristics have an effect on customer satisfaction as well as potential use or intentional application. Due to this, there would be evident benefits of using the system that would be realized. User retention and potential application of data system may be influenced by the net benefits (positively or negatively).
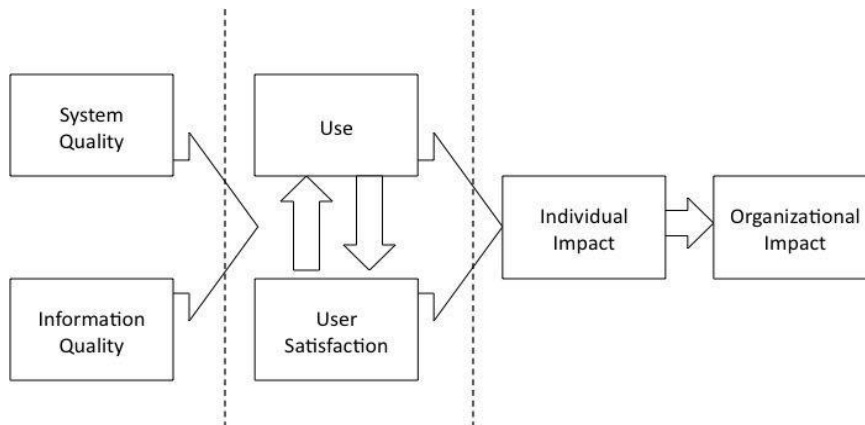
Figure 1: Initial Information Systems Success Model (DeLone & McLean 1992)
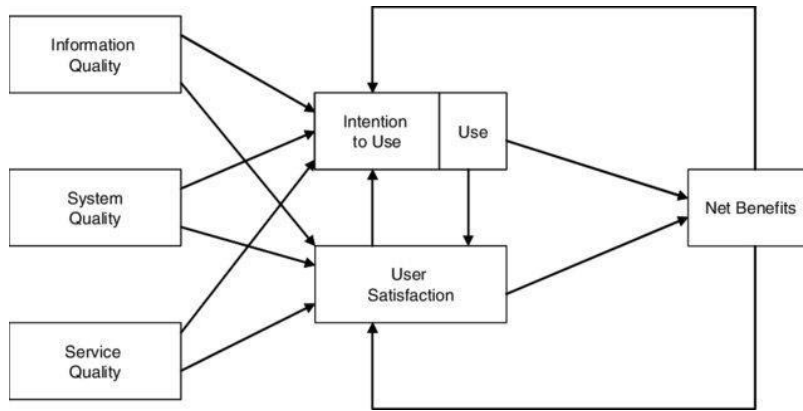
Figure 2. Updated IS Success Model (DeLone and McLean 2003)

2.2 Conceptual Framework

Figure 3 depicts the research's conceptual structure, which is based on the IS performance model (DeLone and McLean 2003). The dimensions specified in the theoretical definition will be used in the analysis.
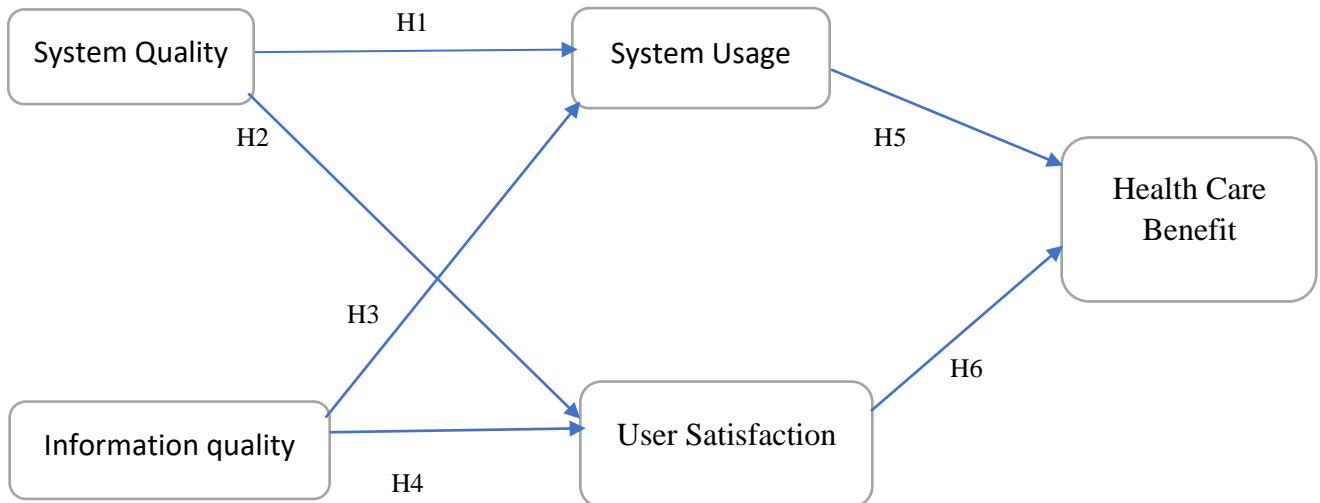
Figure 3. Conceptual framework

Hypothesis Testing:

H1: The system's quality would have a positive effect on the client's/health care worker's use of mobile health applications.

H2: The system's quality would have a positive effect on the client/health care worker's satisfaction with the Mobile Health program.

H3: The use of a mobile health application by a client or a health care professional can be influenced positively by information quality.

H4: Information quality would have a positive effect on client/health care worker satisfaction with Mobile Health applications.

H5: Clients/health care workers who use the system often are more likely to believe that it adds value to clinic appointments/work.

H6: Clients/health care workers who are highly satisfied are more likely to believe that the system adds value to clinic appointments/work.

Table 1: Operationalization of Constructs.

Framework Construct	Meaning	Metrics (Agree,Strongly agree,Disagree,Strongly disagree)
System Quality	Availability	Mobile application available most of the time
	Reliability	The application is reliable and has less downtime
	Responsiveness	Response time of the system
	Easy to use	System is easy to use

	Accuracy	The system's information is right
	Timeliness	Device information is delivered on time
	Importance	The system's information is important
Information Quality	Conciseness	Information from the system is clear
	Completeness	Information from the system is complete
	Usability	Information from the system can be used at all times
	Understability	Information from the system is easy to understand
Use/Intention to use of Mobile Health application	Frequency of use	Frequency of the system use (daily,weekly,monthly)
	Extent of use	Functions used in the system (One,two,three,Four)
User satisfaction	Information satisfaction	Satisfied with the information in the system
	Efficiency	Efficiency of the system
	Effectiveness	Effectiveness of the system

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Chapter three adequately examines on the research design, target population, procedures involved and methods for collecting of data in regard to this analysis. Ethical problems, data interpretation, and presentation of study results are all covered.

3.2 Research Design

Study design refers to the research strategy and processes that vary from broad assumptions to extensive techniques of data collecting and analysis (Creswell, 2018). This provides the framework for the study and includes data collection, Analysis, calculation, and interpretation. The descriptive analysis method was used in the review. Descriptive research entails identifying characteristics of a specific group or circumstance based on an observation or investigating the relationship between two or more variables (Akhtar, 2016). Since the analysis determined the presence of a cause-and-effect relationship between two parties, the experimental testing approach was used (Group 1-received text message and group2-no text message received). Both groups of Clients who were due to attend their clinic appointments during the study period were eligible to be included in the study.

3.3 Target population and Sampling Method

A community is a complete group of persons, cases, or artifacts that share certain measurable characteristics (Mugenda, 1999). The study's target population was patients who have an appointment scheduled during the study period (31st May-4th June 2021), over the age of 15, and own a cellphone.

Stratified random sampling was employed in that group of Male and Female clients and then applied systematic random sampling. The samples were selected based on systematic intervals in a numbered population.

3.4 Data Collection Instruments

The questionnaire was used to obtain primary data from respondents. The questionnaires were developed using relevant measures found through a thorough literature review and conceptual framework.

3.5 Data Collection Procedures

The questionnaires were distributed to participants as they attended their clinic appointments. There was four parts in the questionnaire: information quality, device quality, user satisfaction, and ease of use.

3.6 Data Analysis and Presentation

The primary data was coded and analyzed in Excel and SPSS. Descriptive statistics, which include measures of frequency, central tendency, and variation was used. Non parametrics methods were used because the data was not normally distributed. The findings are shown in the form of charts and tables.

3.7 Ethical Issues

Ethical considerations will be considered. A letter of authorization from ERC office will be acquired prior to data collection. On the Questionnaire there will be a clause to emphasizing that participation is entirely voluntary and ensuring that participants fully understand the scope of the research. All data gathered will be used solely for the purposes of this report.

CHAPTER FOUR

4.0 DATA ANALYSIS AND RESULTS

Part of Data Analysis has been done for a facility which operates manually. A linelist of all the CCC clients was obtained from the facility which had various indicators as follows; Patient ID,Gender, age, Next TCA and Patient Status. The Status of Patients was whether Active, Missed appointments less than and more than 7days, Dead, Defaulter, LTFP.

Out of the 59 patients who were given clinic appointments,17 were Male and 42 were Female as per the below chart.

Chart 4.1 Gender
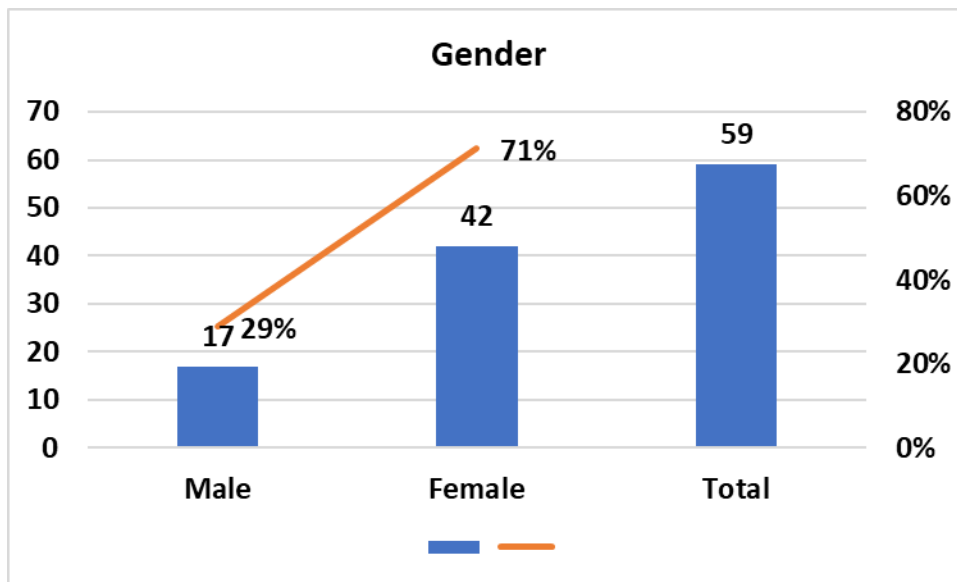
Out of the 59 Patients;1 Died (2%),13 missed their clinic appointments less than seven days (22%) ,9 missed clinic more than seven days (15%) and 36 attended their clinic appointments (61%).

Chart 4.2: Clinic appointments

Clinic Appointments
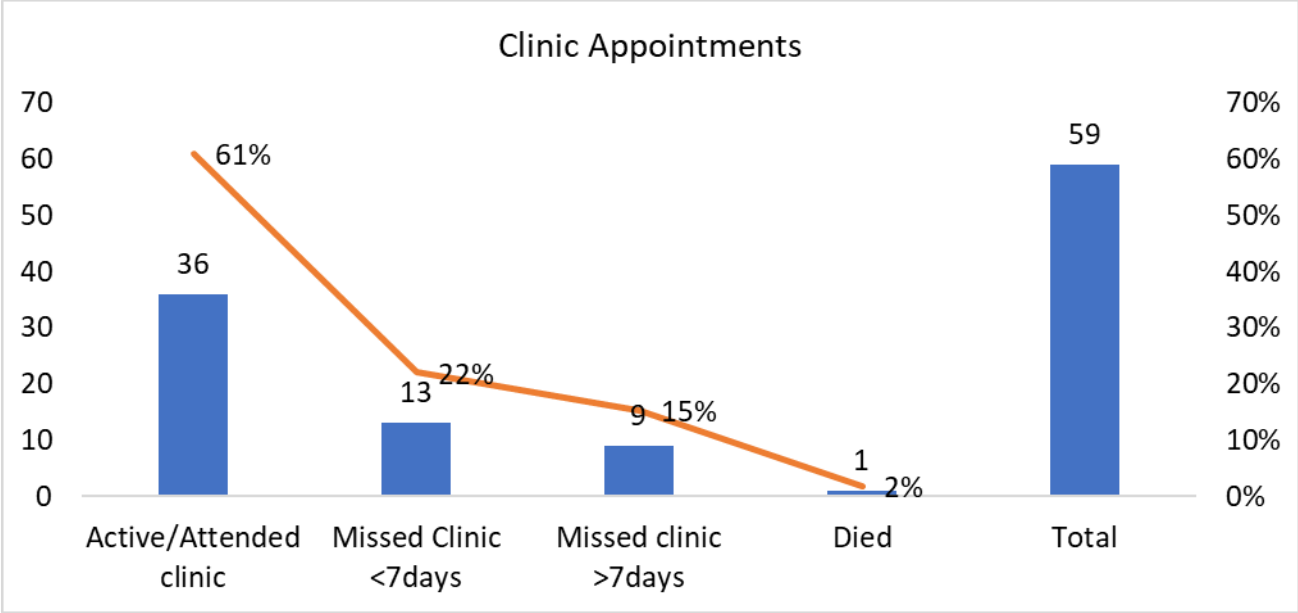
Out of the 59 patients 38 (64%) had cell phones and 21(36%) had no cell phones.Out of the 21 who missed clinic; 18 (86%) did not have cellphones and 3 (14%)did not have cell phone but attended clinic as per the chart below:

Chart 4.3: Cell Phones
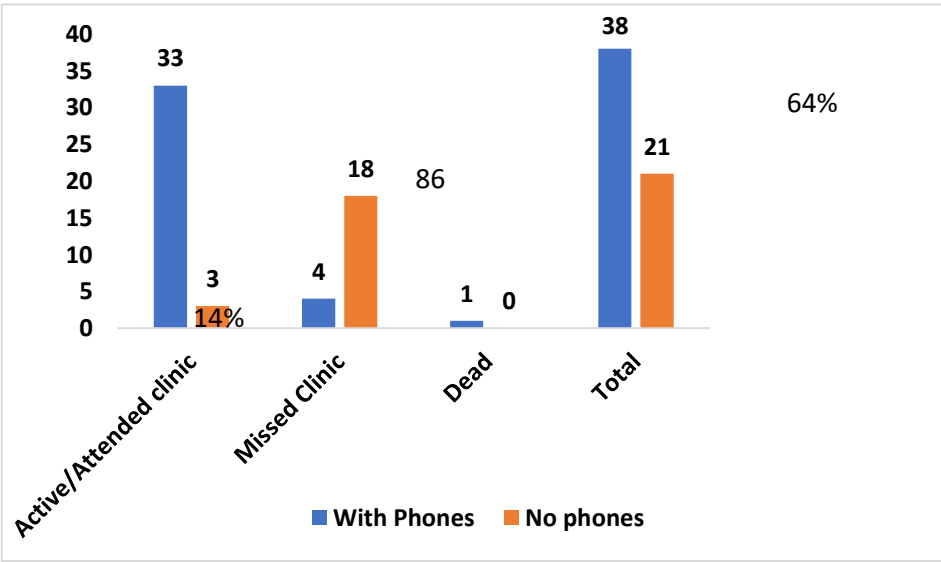
Between 31st of May and 4th June 2021, a total of 109 HIV clients had been booked for their clinic appointments. 38 clients were excluded in the study because they did not own a cell phone. This was 35% of the total clients booked for appointment for the specified period. A sum up of 71 Clients were incorporated in the research which was 65% of the total clients. A total of 40 clients were sent an SMS to remind them of their clinic appointments (56%) and 31 clients were not sent SMS (44%). Out of the 40 who were sent SMS, 37 (92%) attended their clinic appointments and out of 31 who were not sent SMS,23 (74%) attended their clinic appointments. Out of the 60 clients who attended their appointments from both groups,31 (52%) filled the questionnaires. Figure 5 below shows the study procedure which was used in the study.
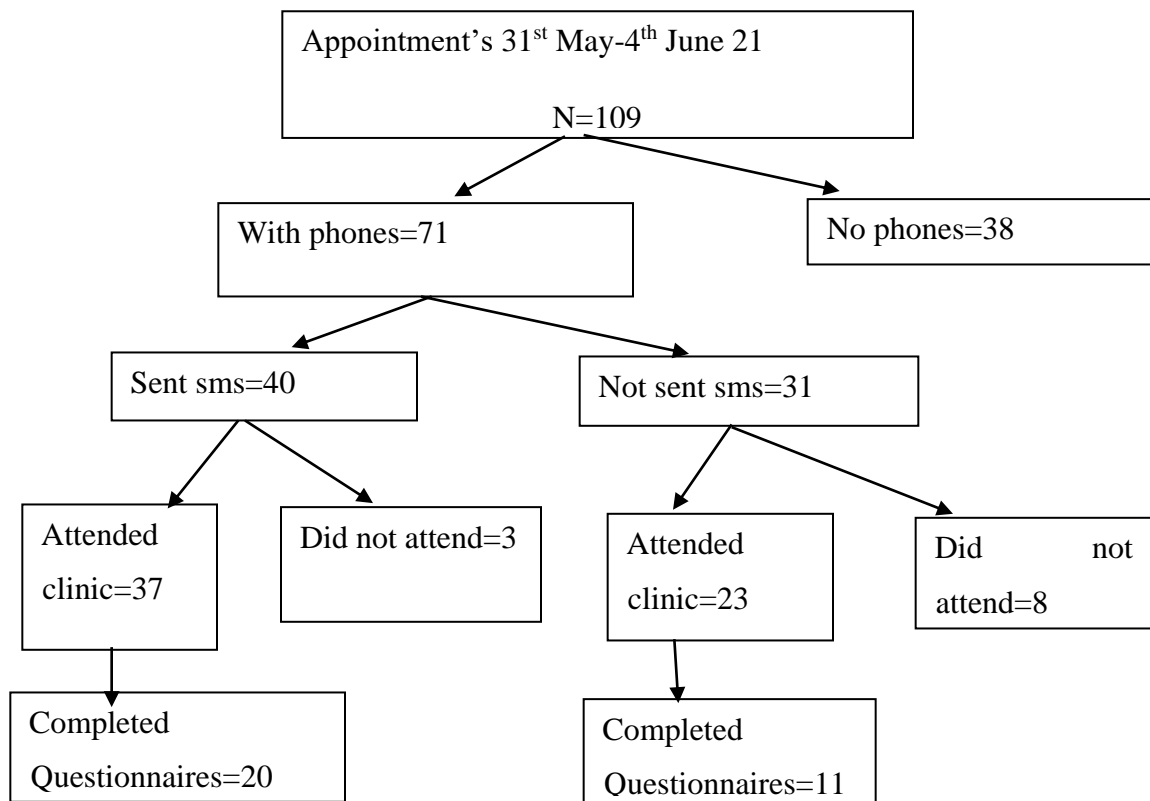
Figure 4: Study Procedure

Chart 4.4: Clinic attendance comparison for the two groups of Clients.
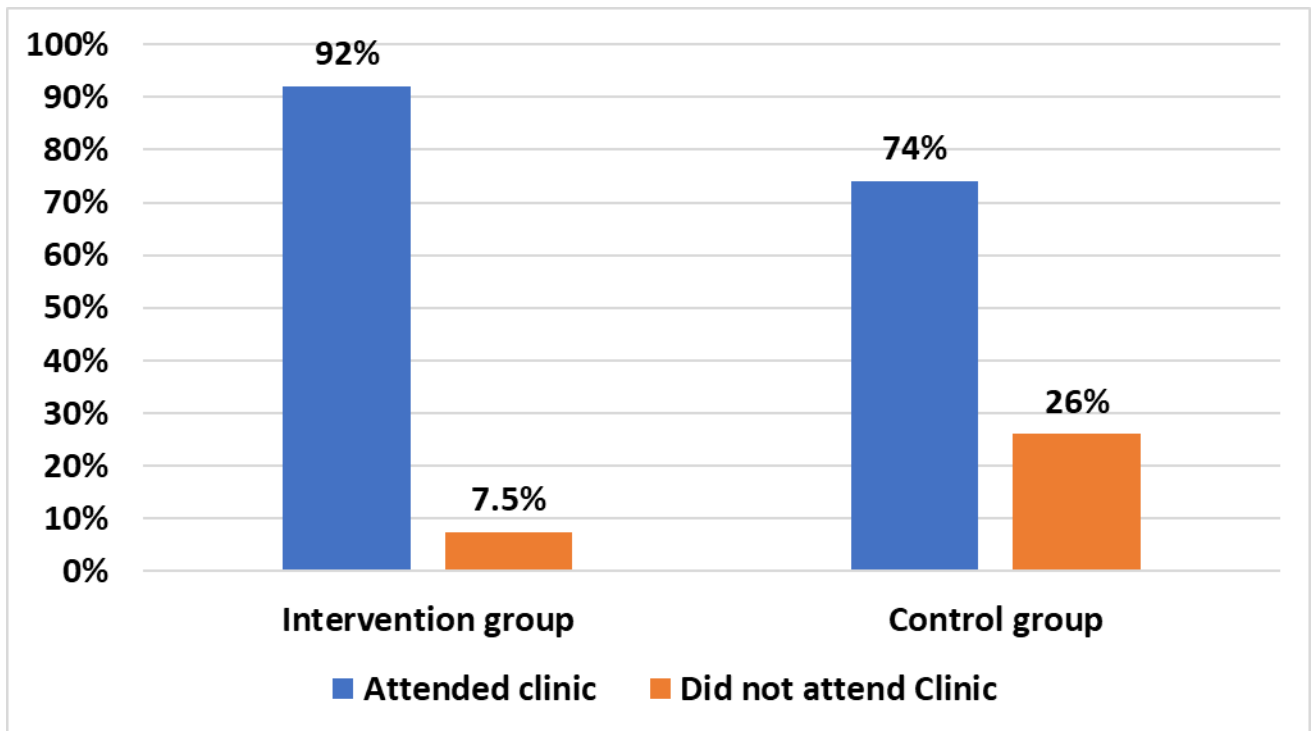
4.1 Analysis of the Questionnaire

Some of the questions were in a scale of 1- 4 (Agree,Strongly agree,Disagree and Strongly disagree)

4.1.1 Gender

Out of the 31 respondents 11 were Male and 20 were Female as per the table below.

Table 2: Gender of the Clients

The Zero represents Male and One represents Female. The results shows that female were more than the Males in the study.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	11	35.5	35.5	35.5
	1	20	64.5	64.5	100.0
	Total	31	100.0	100.0	

4.1.2 Reasons for missing Clinic

The results showed that out the reasons given by the respondents for missing clinic; forgetting was the highest with 44% and felt like they were healed was the least as per the table below;

Table 3: Reasons for missing clinic

Reasons for missing clinic	Frequency	Percentage
1.Forgot	11	44%
2.Stigma	4	16%
3.Long distance to the clinic	3	12%
4.Work schedule	2	8%
5.Lack of fare to attend clinic	2	8%
6.Had travelled upcountry	2	8%
7.Had felt better so thought was healed	1	4%
Total	**25**	**100%**

4.1.3 Section A: Information Quality

Section A had 7 questions and question 1; 100% Response agree. Question2; 71% agree,19% strongly agree and 10% Disagree. Question 3; 84%agree and 16%strongly agree. Question 4; 84%agree,13% strongly agree and 3% Disagree. Question 5; 74%agree,19%disagree and 6.6%strongly disagree. Question 6; 62%agree,32%disagree and 6%strongly disagree. Question 7;81%agree,3%stronglyagree and16%disagree.

4.1.4 Section B: System Quality

The first question;3%agree,71%Disagree and 26%strongly disagree. The second question;87%agree,3%strongly agree and 10%disagree.The third question:65%agree and 35% disagree.Fourth question;94%agree and 6%disagree.

4.1.5 Section C: System Usage

The first question;74%agree and 26%strongly agree. Question2;81%agree,10%disagree and 9%stronglydisagree.Question3;23%agree,74%disagreeand3%strongly disagree.Question4;84%agree and16%stronglyagree.

4.1.6 Section D: User Satisfaction

 The first question;87%agree and 13%strongly agree.Question 2;87%agree,3%stronglyagree and 10%disagree.Question 3;84%agree,10%strongly agree and 6%disagree.Question4;90%agree,6%stronglysgree and 3% disagree.

Table 4: Response table

	IQ1	IQ2	IQ3	IQ4	IQ5	IQ6	IQ7	SQ1	SQ2	SQ3	SQ4	SU1	SU2	SU3	SU4	US1
Agree	100%	71%	84%	84%	74%	61%	81%	3%	87%	65%	94%	74%	81%	23%	84%	87
Strongly agr	#DIV/0!	19%	16%	13%	0%	0%	3%	0%	3%	0%	0%	26%	0%	0%	16%	13
Disagree	#DIV/0!	10%	#DIV/0!	3%	19%	32%	16%	71%	10%	35%	6%	0%	10%	74%	0%	0
Strongly Dis	#VALUE!	#VALUE!	#DIV/0!	#DIV/0!	6%	6%	0%	26%	0%	0%	0%	0%	10%	3%	0%	0

The sample size is small, and the data is not normally distributed. The Likert scales are ordinal; thus

Mann-Whitney U test has been used to compare groups.

Table 5: Results of all the variables

Variable	Observation		P value
Information quality	Satisfied	29	0.227
	Unsatisfied	2	
System quality	Satisfied	19	<0.005
	Unsatisfied	12	
System usage/intention to use	Satisfied	22	<0.005
	Unsatisfied	9	
User satisfaction	Satisfied	29	0.181
	Unsatisfied	2	
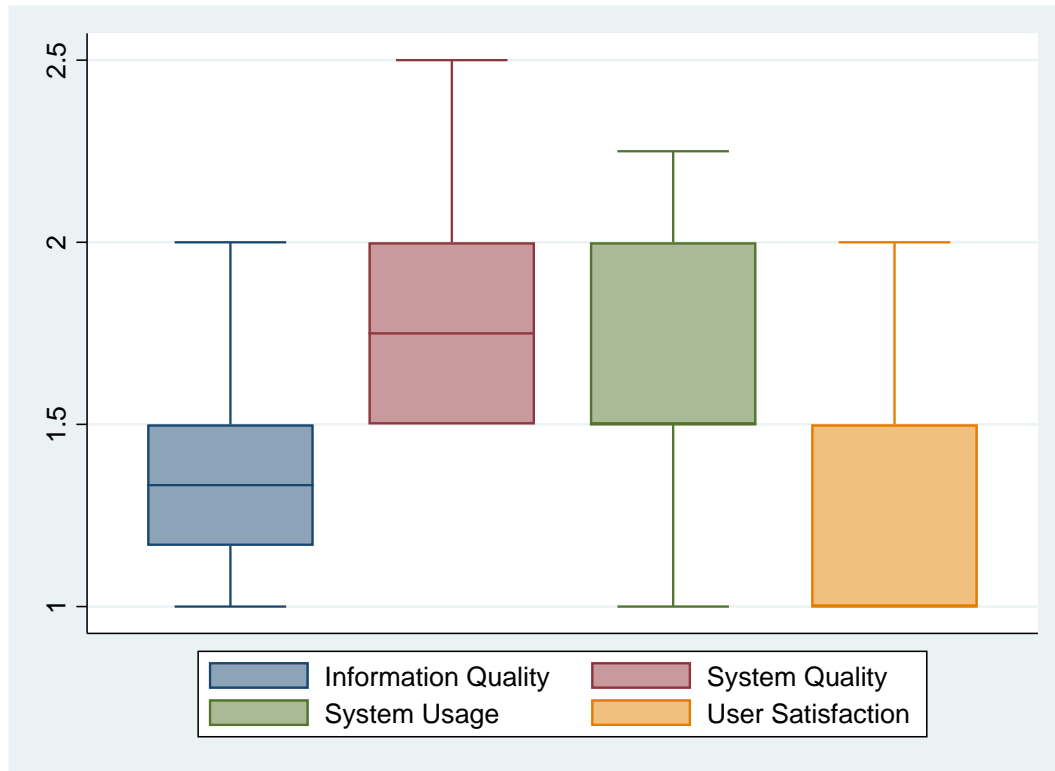
Figure 5: Box plot

4.2 Hypothesis Testing

H1: The system's quality will not have a positive effect on the client's/health care worker's use of mobile health applications.

The observation on system quality shows that the P value=<0.005 which indicates that there is significant value on the use of the mobile applications. Therefore, I reject the null hypothesis.

H2: The system's quality will not have a positive effect on the client/health care worker's satisfaction with the Mobile Health program.

The observation on system quality shows that the P value=<0.005 which indicates that there is significant value on the satisfaction of the mobile applications. Therefore, I reject the null hypothesis.

H3: The use of a mobile health application by a client or a health care professional cannot be influenced positively by information quality.

The observation on Information quality shows that the P value=0.227 which indicates that there is no significant value on the use of the mobile applications. Therefore, I fail to reject the null hypothesis.

H4: Information quality will not have a positive effect on client/health care worker satisfaction with Mobile Health applications.

The observation on Information quality shows that the P value=0.227 which indicates that there is no significant value on the satisfaction of the mobile applications. Therefore, I fail to reject the null hypothesis.

H5: Clients/health care workers who use the system often are not likely to believe that it adds value to clinic appointments/work.

The observation on use of the system shows that the P value=<0.005 which indicates that there is significant value on the value addition of the mobile applications. Therefore, I reject the null hypothesis.

H6: Clients/health care workers who are highly satisfied are not likely to believe that the system adds value to clinic appointments/work.

The observation on use of the system shows that the P value=<0.005 which indicates that there is significant value on the value addition of the mobile applications. Therefore, I reject the null hypothesis

CHAPTER 5

5.0: Summary, Conclusion and Recommendations

This chapter indicates summary findings based on research objectives and alignment of the research framework.

5.1: Summary findings

Objective 1. To determine the factors that influence mobile application of information system access

Through review of related Literature and analysis of collected data, the factors that influence mobile application of information accessibility includes; the quality of connection and service provided, the quality of system, easy application and use, and lastly the quality of information (N.Aeni Hidayah, 2020).

Objective 2. To determine the effectiveness of using mobile phones in achieving health outcomes

From the literature review it was established that upholding the expectations of treatment and adherence to medical appointments have always been the vital ingredients for having the right quality towards life, and contributing in extending the lifespan to most HIV and IDS patients. living with HIV and AIDS. Where patients living with HIV and AIDS lack the right consistency in their appointment and have therapies that are not consistent contribute in having a viral resistance, complication that particularly relate to HIV and AIDS, and witnessing failure in medication (Nishal et al 2019).

Objective 3. To Evaluate the effectiveness of SMS reminders in reducing missed clinic appointments in HIV Clinic.

The study results showed that text messaging reminders for clinic appointments reduced missed clinic appointments. This concurred with the study done by Nishal, et al. (2019) which its findings showed that most patients who had received an email or a text message in their mobile phones alerting them of their usual appointment resulted in turning up for the appointment.

This study also concurred with the study done by Haji (2016) which reveals that there was a higher coverage to vaccination done via SMS intervention in the community over the usual control group.

5.2: Conclusion

This study showed that use of short messaging service to remind clients of their clinic appointment dates reduces missed clinic appointments. The intervention group clinic attendance was at 92% while the clinic attendance for the control group was at 74%. This was a difference of 18%. The study showed that information quality, system quality determines the usage of mobile applications and there is value addition on the users who use the mobile applications often.

5.3: Limitations of the study

The research was limited to Nakuru county and only one specific facility in the county hence other facilities offering the same services were left out. The study period was limited to one week

5.4: Recommendations for further Research

The use of Mobile applications in healthcare settings in different clinic specialty has not been fully utilized. It is desirable that the mobile applications in health care to be utilized fully to improve clinic attendance rate, adherence to medication and other HealthCare benefits. Since the study was limited

to one facility, it is suggested that similar study to be done in the other facilities offering the same

healthcare services.

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APPENDICES:

Appendix 1

Questionnaire

Dear Respondent,

We are conducting research on the impact of SMS text reminders on clinic appointment attendance.

The aim of this study is to assess the effectiveness of text reminders. We will be able to learn about the advantages of mobile health apps in the form of text reminders of clinic appointments, which are significant in terms of health outcomes. Since the information gathered is solely for academic purposes, all responses are confidential.

Instructions: Put a tick (√) in the boxes provided.

1.Gender: Female ☐   Male: ☐

2a. Has the client ever missed his/her clinic Appointments? Yes ☐   No. ☐

2b. If yes, what was/were the reason/reasons?
       (i)Forgot
       (ii) Had felt better so thought was healed
       (iii) Long distance to the clinic
       (iv) Work Schedule
       (v) Stigma
       (vi)Lack of fare to attend clinic
       (vii) Had travelled upcountry
3. Sent Message (SMS) Yes ☐   No. ☐

Serial No	Metrics	Agree	Strongly Agree	Disagree	Strongly Disagree
Section A: Information Quality					
1	Information from the Mobile application is accurate.				
2	Device information is delivered on time				
3	The system's information is important				
4	Information from the system is clear				
5	Information from the system is complete				

6	The system's information can be used at all times				
7	Information from the system is easy to understand				
	Section B: System Quality				
1	The mobile application is dependable, with no downtime				
2	The mobile application's response time is satisfactory.				
3	The mobile app is simple to use.				
4	The mobile application is generally available.				

	Section C: System Usage/Intention to use				
1	I understand why I'm using the mobile application.				
2	I frequently use the Mobile application framework.				
3	I use every feature of the mobile application.				
4	I use mobile apps on a regular basis.				
	Section D: User Satisfaction				
1	I am pleased with the mobile application for reminding me my appointments.				
2	Using the mobile application to confirm my appointment, I can complete the tasks easily.				
3	I am confident in using a mobile app to check my clinic appointments.				
4	I agree that using the mobile application would result in fewer missed clinic appointments.				

PROJECT BUDGET

Serial Number	Item Description	Quantity	Cost	Total
1	Airtime for phone Call charges	5*1000	5000	5000
2	Internet Bundles		10000	10000
3	Laptop	1	50000	50000
4	Stationary		5000	5000
5	Miscellaneous		10000	10000
Total				**80000**

PROJECT SCHEDULE:

Tasks	Project Timeline								
	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21
Decide Project Topic									
Develop Research proposal									
Literature Review									
Develop Questions for data collection									
Data Collection									
Milestone 2 Presentation									
Data Coding and Analysis									
Milestone 3 Presentation									