# EFFECT OF INFORMATION TECHNOLOGY INFRASTRUCTURE ON CUSTOMER RELATIONSHIP MANAGEMENT IN PRIVATE HOSPITALS IN KENYA

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# EFFECT OF INFORMATION TECHNOLOGY INFRASTRUCTURE ON CUSTOMER RELATIONSHIP MANAGEMENT IN PRIVATE HOSPITALS IN KENYA

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## Abstract

**Purpose:** The purpose of this study was to establish the effect of information technology infrastructure on customer relationship management in private hospitals in Kenya

**Materials and Methods:** The study adopted descriptive survey design. It targeted 161 private hospitals which are accredited by NHIF in Kenya and which formed the unit of analysis of the study. Simple random sampling was then be used to obtain the 644 respondents. The researcher utilized a structured questionnaire with a five-point Likert scale to gather the data. The collected data was coded and entered in SPSS for further analysis. Descriptive and inferential analysis was conducted. Before inferential analysis was conducted, diagnostics tests were done.

**Results:** The findings indicate there was a statistical and significant relationship between information technology infrastructure and customer relationship management. Therefore, the research theory was rejected and the substitute hypothesis that information technology infrastructure has a statistically significant effect on CRM in private hospital was supported. The results show that if private hospitals enhanced their technology initiatives such as interconnecting operating systems, installing human-friendly machine system and improving network and telecommunication technology, patients would be satisfied with their services and would come back or refer a friend.

**Unique contribution to theory, practice and policy:** The study recommends that hospitals ought to enhance their CRM policies so as to deliver quality services that satisfy Information technology infrastructure can revolutionize healthcare with the right policy choices. IT can foster new human connectivity thresholds and is a powerful tool of global convergence through the cross-border provision of services and can as well provide new opportunities for the production of knowledge and skills.

**Key words:** *Information Technology, Infrastructure, Customer Relationship Management,*

*Private Hospitals*

## 1.0 INTRODUCTION

One of the main challenges facing healthcare organisations around the world today is that of an ageing population and healthcare service providers will need tools to help them overcome these new challenges (Graeme, 2010). In his research paper "The Role of Information Technology in Healthcare Trade Designs", Mathur (2013) stated that Information and communication technologies (ICT) can revolutionise healthcare. He believed that with the right policy choices, IT can foster new human connectivity thresholds and is a powerful tool of global convergence through the cross-border provision of services. Mathur (2013) continued to argue that IT provides new opportunities for the production of knowledge and skills, the only factor of production not subject to the economic laws of decreasing profits, and for direct economic advantages to trade in it. Secondly, the international dissemination of new knowledge and best practices opens up new ways to improve health systems performance.

According to (Graeme, 2010), an intelligent technology infrastructure (ITI) is a mechanism that stems from the progressive development of Information Communication Technology (ICT) and other emergence of protocols for wireless and mobile communication. According to him, the tool (ITI) functions as the hospital's central nervous system combining historically disparate systems such as electricity, building management, protection and IT to allow connectivity between systems, as well as real-time monitoring, optimisation and automation. When the systems of a hospital talk to each other, the infrastructure itself is enhanced and intelligence is build, thus making the use of all resources more effective. However, Dixon (2009) says that when adopting technology-based service innovations, they need to not only consider the costs and benefits of that technology but also the reactions of customers to the procedural changes that accompany the innovation.

Information technology infrastructure in hospitals can help improve customer relationship management by improving the journey of each patient through the healthcare process. Mans (2011) says patients now have more choices in many parts of the world as to where they receive their healthcare services, putting additional pressure on hospitals to remain competitive. Good or bad, a patient's experience in a hospital is likely to have an impact on their decision to return when they need care next. The journey of a patient's experience will be affected by a variety of factors including clinicians, catering, cleaning, and the health centre itself. This is in line with works by Hung, Chang, Yen and Lee, (2015) who claimed that by integrating medical facility hardware and software and allowing wireless communication, medical staff can access the information they need to keep patients healthy and comfortable with their overall experience at any time. Richardson (2005) further stated that mobile solutions enable practitioners to remain in continuous contact, whether on the patient's bedside, in examination rooms or in emergency treatment centres, to develop and deliver patient assessments effectively, and to make more informed care decisions based on collaborative treatment plans.

There have been many studies regarding the role of technology in the customer relationship management. Research by Dasha and Panda (2011) on the management of customer relations in

private healthcare facilities in India concluded that technology is really important in the healthcare business to manage customer and employee relationships in order to guarantee the best service and most importantly, to avoid errors. This is because, in the field of health care, a small mistake could lead to a permanent error or even death. Similar views were echoed by Wanjau et. al (2012) in their research on factors influencing quality of service delivery at Kenyatta National Hospital after they concluded that hospitals with willingness to adopt technology reduce time lags and also helps to shape the culture, patient diversity, employment as well as involving doctors and nurses in creation or adoption of Information Technology to ensure that the final system meets the demands of clinicians.

Johnson and Sirikit, (2012) did a research on service quality in Thai Telecommunication industry. The research utilized cross sectional survey design. The population of the study contained land line phone subscribers in Telecom Asia (TA) and Thai Telecom and Broadcast (TT&T) and cell phone subscribers in Advance Info Services (AIS) and Total Access Communication (TAC). Questionnaires were used to collect data and convenience sampling was then used to obtain a representation of the entire population. Research showed that the customer's perception of the value of service in each telecommunications company is statistically significant. In each telecommunications company, there was also a significant difference in customer expectations of service quality.

Foya (2015) conducted a research study into the effect of technology-based customer relationship management on telecommunications service quality in Tanzania. The study used explanatory and descriptive research designs and the target population comprised two Tanzanian telecommunications. A multi-stage sampling technique was employed to extract a representative sample size of 323 respondents from the entire population. The research utilized structured questionnaires in collecting data. The test results indicate that the connection between system automation and system efficiency and service quality do not exist in a statistically significant way. However, the research found that there is a statistically significant association between system user acceptance and system integration in service quality. The study further found that integration of technology-based CRM resources with other aspects of the micro environment, such as competitiveness and supplier behaviour, is important for service-based firms. In addition, the study suggested, the need to incorporate attributes such as demographic and psychological characteristics of individual IT users in future researches on technology based CRM.

Kangu (2017) investigated technology infrastructure as a component of maintaining customer relationship management in hotel industry in Kenya using the non- experimental cross-sectional survey layout. An aggregate of 147 hotels that are recorded in the Kenya Association of Hotel Keepers and Caterers (KAHC) guide 2014 were considered. Census sampling technique was utilized. Respondents contained 147 customer relationship managers or equivalent positions. Semi structured surveys were utilized to gather essential information. Qualitative and quantitative procedures were utilized to analyze data. Results showed that the hotel industry had compelling technology infrastructure and that technology facilities were a key determinant of

customer loyalty. The study summarized that technology infrastructure in the hotel sub area in Kenya were key determinants to client loyalty. The investigation advises that the hotel management should ensure hotels are updated with the latest technology changes occurring in the entire world as well as perform a market overview of the technological facilities being used in different hotels, with a view to decrease high competition from competitors.

The impact of technologies on growth of businesses in Nairobi was examined by Olwenyi (2017) with the Immigration Directorate as the case study. Business growth represented dependent variable and technological attributes such as e-service, digital publicity and online client service were the independent variables, while customer relationship management acted as mediating variable of the study. Descriptive research design which allowed employment of questionnaires as the main research instrument was used. Sample size of 44 participants was taken from the population which comprised of the entire staff of immigration directorate services. After data evaluation, the study concluded that information technology had a significant impact on the performance of the business. The study established significant relationship between information technology constructs used in the study and the performance of the business. Further, the study observed that customer relationship management was a significant mediator implying that information technology constructs had positive relationship with CRM which means if the organization chooses to focus on CRM it would achieve similar results.

Wataku (2013) investigated the impact of e-service on worker satisfaction at Kenya airways limited. The research attempted to assess the effect of e-service flexibility and employee satisfaction, reliability and employee satisfaction, e-service functionality and employee satisfaction, and e-service performance and employee satisfaction. A mix-approach of research design comprised of quantitative and qualitative methodologies. The researcher utilized structured questionnaire with closed ended questions. The observed population was 2,611 employees. The investigation drew 15.3% of the population totalling to 400 employees as test sample. The outcome of the analysis proposed that the respondents belonged to same department and the technique of training was essential in deciding the level of fulfilment with the e-service.

Reviewed literatures on technology and CRM indicate positive influence of technology on implementation and success of CRM. However, most of the studies especially in Kenya have focused on other industries. For instance Johnson and Skirit (2012) and Foya (2012) focused on the telecommunication industry while Kangu (2017) studied food industry and Olwenyi (2017) manufacturing industry. Only one study on health sector was done by Wanjau (2012) on the effect of technology on service quality at KNH which is a public hospital. This study failed to directly show the impact of information technology on CRM implementation particularly in profit focused private hospitals. Therefore, this study will try to fill this gap by studying information technology and its impact on CRM. In that regard, the study hypothesis there is significant relationship between information technology and CRM. To confirm hypothesis, the study will test the null hypothesis that there is no significant relationship between information technology and CRM.

## 1.1 Statement of the Problem

Global health statistics report on monitoring health for SDGs indicated that regardless of the effort reached during the Millennium Development Goals (MDG) era, eradicating maternal and child mortality, enhancing nutrition, and progressing further in the battle against communicable diseases remain a major challenge. According to global competitiveness Survey on health investment, Kenya was ranked position 91globally, position 6 in Africa and position 2 in East Africa. The survey concluded that weak and poor health systems remain a hindrance to progress resulting in insufficient in coverage for the most basic health services.

AU Agenda 2063 aim is for every citizen to have full access to affordable, quality and comprehensive health services. The agenda however states that the main challenge in healthcare system is that Africa countries lack advanced modern technology and informatics tools. Kenya vision 2030 and big four agenda aim to attain universal health coverage that is accessible and affordable as well as safe medicines and vaccines for all. Additionally, government intends to upscale insurance scheme to all Kenyans to increase the universal health coverage through NHIF registration. This however remains a challenge and a complex task.

All these statistics demonstrate a gap in the industry, owing to the government's effort to fund and improve health standards of Kenya. As such, hospitals can contribute to agenda through effective CRM/ PRM to increase health coverage and improve health standards. Enhanced management of customer relationship in healthcare organizations is an important component in meeting customers' demands and therefore attracting, maintaining, and building customer loyalty.

Literature from different studies shows that the Kenyan hospitals' information system applications (such as hospital automation, electronic database and patient information) gather data entirely from hospital staff's viewpoints. Study done by Kathithi, in Mbagathi hospital found out that staff were not experienced in CRM practices. Yung et.al.,(2018) did a study on CRM Systems adoption in hospitals and concluded that CRM is influenced by hospital size, complexity and compatibility. These studies failed to determine factors that contribute to low CRM adoption in hospitals as well as determine the extent of implementation. Lack of customer feedback denies hospitals the opportunity to learn the needs, aspirations and contribution of a crucial mass in their value chain. Thus decision-making may be based on incomplete and skewed information that may lead to waste, inefficiency, ineffectiveness and in worst case scenario poor management practices.

## 2.0 METHODOLOGY

The study adopted descriptive survey design. It targeted 161 private hospitals which are accredited by NHIF in Kenya and which formed the unit of analysis of the study. Simple random sampling was then be used to obtain the 644 respondents. The researcher utilized a structured questionnaire with a five-point Likert scale to gather the data. The collected data was coded and entered in SPSS for further analysis. Descriptive and inferential analysis was conducted. Before

inferential analysis was conducted, diagnostics tests were done. Descriptive statistics (frequencies, mean scores, and standard deviations) were used to describe the characteristics of the variables. Descriptive statistics provide the basic features of the data collected. Factor analysis was conducted to assess the convergent validity of the hypothetical constructs. Inferential statistics was used to conclude the findings of test done on a population by taking a sample of information from the large population. The inferential statistic techniques were used to measure the significance of the relationship while the bivariate regression was employed to was used to evaluate the role of IT infrastructure in customer relationship management in private hospitals in Kenya.The results of the study were presented using tables, cross tabulation, frequency and percentage.

## 3.0 RESULTS

### 3.1 Descriptive statistical Analysis Results

### 3.1.1 Analysis for Information Technology Infrastructure

The study sought to establish the effect of information technology infrastructure on customer relationship management in private hospitals in Kenya. The descriptive results on information technology infrastructure are as depicted in Table 1.

**Table 1: Results for Drivers for Information Technology Infrastructure**

| Statements | SD % | D % | N % | A % | SA % | Mean | S.D |
|---|---|---|---|---|---|---|---|
| IT infrastructure integrates and facilitates departmental and functional hand-offs and as a result response time has greatly reduced. | 1 | 11 | 13 | 40 | 35 | 3.97 | 1.00 |
| Records can be stored and retrieved easily due to computerization. | 0 | 14 | 14 | 36 | 37 | 3.95 | 1.04 |
| Mobile phone contact with patients has enhanced the quality of services | 0 | 13 | 14 | 38 | 35 | 3.94 | 1.01 |
| Local area network and wide area network are highly used within the organization and this speeds the communication process with departments and stakeholders. | 0 | 13 | 15 | 35 | 37 | 3.96 | 1.03 |
| IT infrastructure has enhanced the billing and payment procedure and this has reduced average length of stay(ALOS) | 0 | 13 | 11 | 39 | 37 | 3.99 | 1.02 |
| **Average** | | | | | | **3.96** | **1.02** |

From the results on information technology infrastructure, 40% of the respondents agreed that IT infrastructure integrates and facilitates departmental and functional hand-offs and as a result response time has greatly reduced with mean of 3.97 and a standard deviation of 1.0 indicating

that that the values in the data set had variations from the mean. Further, 37% of the respondents strongly agreed that records can be stored and retrieved easily due to computerization with mean of 3.95 and a standard deviation of 1.04.

On whether mobile phone contact with patients has enhanced the quality of services, 38% of the respondents agreed with a mean of 3.94 and a standard deviation of 1.01 indicating that the values in the data set had variations from the mean. 37% the respondents strongly agreed Local area network and wide area network are highly used within the organization and this speeds the communication process with departments and stakeholders with a mean of 3.96 and standard deviation of 1.03. Lastly, 37% of the respondents agreed that IT infrastructure has enhanced the billing and payment procedure and this has reduced average length of stay (ALOS) with a mean of 3.99 and a standard deviation of 1.02. The overall mean was 3.96 that showed that majority of respondents either agreed or strongly agreed to the statements on Information Technology Infrastructure with variations of 1.02 all other factors held constant. This therefore implied that most hospitals had information technology infrastructure in place and were the technology.

### 3.2 Factor Analysis

### 3.2.1 Factor Analysis for Drivers for Information Technology Infrastructure

Factor analysis was conducted on the statements on Information Technology Infrastructure. This was done by subjecting the statement to dimension reduction in SPSS where any sub variable with a value less than 0.5 was removed.

(a) **Test Sampling Adequacy for Information Technology Infrastructure**

**Table 2: KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .749 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1.292 |
| | df | 10 |
| | Sig. | .000 |

From the Table 2; it was clear that KMO value was 0.749 which is more than 0.5. This indicates that the data is adequate for proceeding with factor-analysis. Bartlett Test shows the significance value of 0.000 which is less than 0.05 which also confirms the data adequacy for conducting analysis using factor-analysis since all variables are completely independent of each other as suggested by Pallant (2013). This was followed by running of factor-analysis technique. The two main stages of factor-analysis namely Factor Extraction Process and Rotation of principal components has been shown in Table 3. The solution could not be rotated since only one component was extracted.

(b) **Total Variance Explained**

According to Mabert et al., (2003), factor loading with Eigen values greater than 0.5 should be extracted and below 0.49 not considered. Under information technology infrastructure, three sub variables were adopted as they had values greater than 0.5 as shown in Table 4.15. Hair, *et al.* (2006) stated that each individual variable must have value 0.5 and above. From the displayed results, the variables of information technology infrastructure explained 62.6% of variance.

**Table 3: Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 3.132 | 62.640 | 62.640 | 3.132 | 62.640 | 62.640 |
| 2 | .891 | 17.821 | 80.460 | | | |
| 3 | .504 | 10.079 | 90.540 | | | |

Extraction Method: Principal Component Analysis.

### (c) Scree Plot for Information Technology Infrastructure

Figure 1 presents the scree plot with the extraction of eigenvalues on the y axis and the number of factors on the x axis. The Scree plot shows that after the first component, differences between the eigenvalues decline (the curve flattens), and they are less than 1.0. The curve shows the variance explained with a break point of one factor with eigenvalues and all other four parameters in the variable were included for the regression analysis.
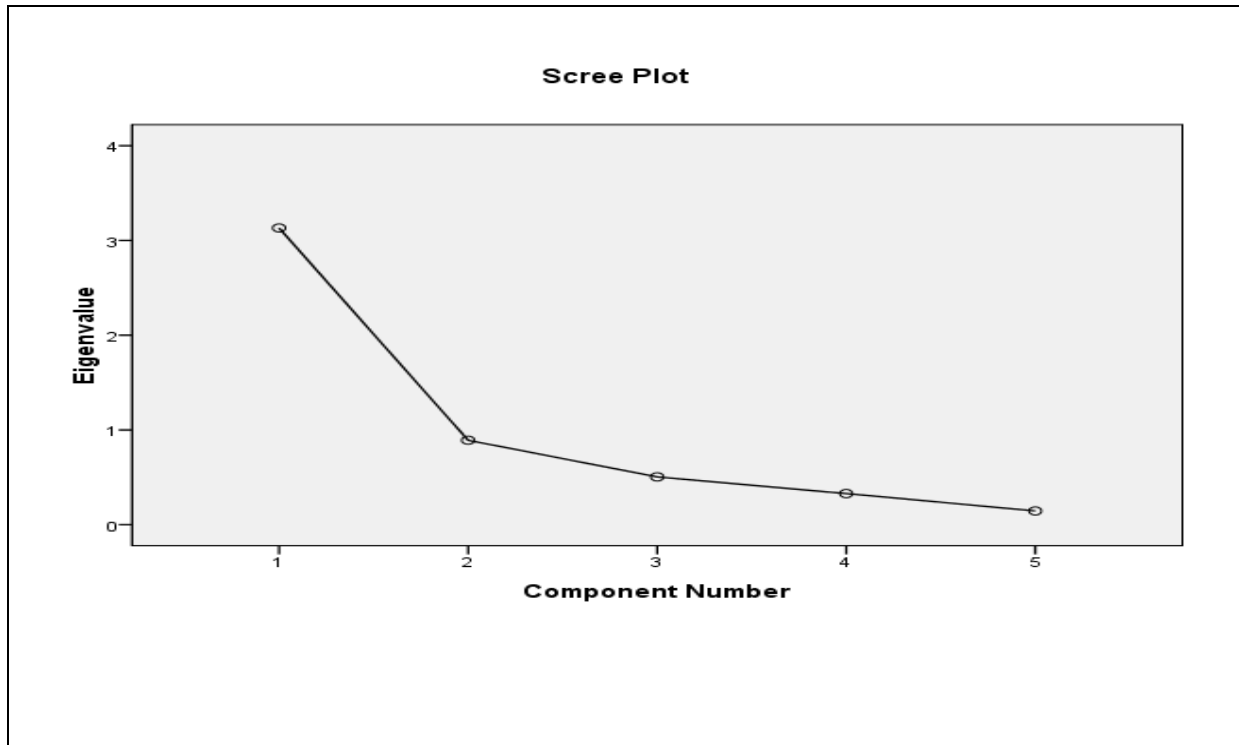
**Figure 1: Scree Plot for Information Technology Infrastructure representing the Eigen values and the proportion of variance accounted for by the principal components**

**3.3 Inferential Analysis of Information Technology Infrastructure on CRM**

**3.3.1 Effect of Information Technology Infrastructure on CRM**

The study sought to examine effect of information technology infrastructure on customer relationship management in private hospitals in Kenya. A simple regression model was used to test the statistical significance of the independent variable (information technology infrastructure) on the dependent variable (customer relationship management) in private hospitals in Kenya. The first hypothesis stated in the null form is as follows:

**Ho$_1$: Information technology infrastructure has no significant effect on customer relationship management in private hospitals in Kenya**

The following section presents the R square value for regression model summary, F statistics for regression ANOVA and t statistics for regression coefficient for the linear relationship between Information Technology Infrastructure and customer relationship management in private hospitals in Kenya.

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**Table 4: Linear Relationship between Information technology infrastructure and CRM**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .759a | 0.576 | 0.575 | 0.25216 |

Table 4 shows the model summary of the regression analysis. The R-squared is a goodness-of-fit measure for linear regression models. This statistic indicates the percentage of the variance in the dependent variable that the independent variables explain collectively. R-squared measures the strength of the relationship between the model and the dependent variable. The findings of the model summary indicate that information technology infrastructure explained 57.6% of the variability in customer relationship management in private hospitals all other factors held constant.

**Table 5: ANOVA for Linear Relationship between Information technology infrastructure and CRM**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 41.363 | 1 | 41.363 | 650.523 | .000b |
| Residual | 30.457 | 479 | 0.064 | | |
| Total | 71.82 | 480 | | | |

ANOVA was used to check the residual variance is reduced by predictors in regression model and the overall model significance. The linear regression F statistics shown in Table 5 shows that there was a statistical and significant linear relationship between information technology infrastructure and customer relationship management F $(1,480) = 71.82, p=0.000 < .05$). The $p=0.000 < .05$ was less than 0.05 and thus implied that the overall model was statistically significant.

**Table 6: Regression Coefficients for Linear Relationship between Information technology infrastructure and CRM**

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | t | Sig. |
| (Constant) | 3.405 | 0.032 | | 106.952 | 0.000 |
| Information Technology Infrastructure | 0.252 | 0.01 | 0.759 | 25.505 | 0.000 |

The regression coefficients presented in Table 4.28 shows that Information technology infrastructure had a statistically and significantly effect on the CRM in private hospitals($\beta = 0.252, t(481) = 25.505, p\ 0.000 < .05$. The estimated regression equation is given by:

$$CRM = 3.405 + 0.252 * Information\ Technology\ Infrastructure$$

The model shows that Information Technology Infrastructure positively affects the customer relationship management in private hospitals in Kenya in that, if one unit of Information

Technology Infrastructure is applied, it increases the customer relationship management in private hospitals in Kenya by a positive mean index value of 0.252. Given the ANOVA of 0.000 and Information Technology Infrastructure had a P-value of 0.000=0.05, the study thus, rejected the null hypothesis and adopted the alternative hypothesis that Information technology infrastructure has a significant effect on customer relationship management in private hospitals in Kenya. This is consistent with Dasha and Panda (2011) on the management of customer relations in private healthcare facilities in India who concluded that technology is really important in the healthcare business to manage customer and employee relationships in order to guarantee the best service and most importantly, to avoid errors. The findings are also in line with Wanjau et. al (2012) whose study on factors influencing quality of service delivery at Kenyatta National Hospital they concluded that hospitals with willingness to adopt technology reduce time lags and also helps to shape the culture, patient diversity, employment as well as involving doctors and nurses in creation or adoption of Information Technology to ensure that the final system meets the demands of clinicians.

## 4.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

### Summary

The findings indicate there was a statistical and significant relationship between information technology infrastructure and customer relationship management. Therefore, the research theory was rejected and the substitute hypothesis that information technology infrastructure has a statistically significant effect on CRM in private hospital was supported. The results show that if private hospitals enhanced their technology initiatives such as interconnecting operating systems, installing human-friendly machine system and improving network and telecommunication technology, patients would be satisfied with their services and would come back or refer a friend.

### Conclusion

The study concluded that since technology is ever changing, hospitals should keep up the pace in employing the latest technology as it provides a variety of systems for conducting businesses to manage customer relationships efficiently and effectively. Strategic use of information technology infrastructure gives hospitals the ability to monitor and predict health of their patients. Hospitals can use various information technology infrastructures that span from simple charting, to more advanced decision support and integration with medical technology. Systems such as Electronic physician's orders and E-prescribing, Clinical decision support, Electronic sign-out and hand-off tools, Bar code medication administration, Automated medication dispensing technology, Telemedicine among others to enhance patient's safety and in turn good customer relationship.

### Recommendations

The study recommends that hospitals ought to enhance their CRM policies so as to deliver quality services that satisfy Information technology infrastructure can revolutionize healthcare with the right policy choices. IT can foster new human connectivity thresholds and is a powerful

tool of global convergence through the cross-border provision of services and can as well provide new opportunities for the production of knowledge and skills.

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