EFFECTS OF TECHNOLOGY ADOPTION ON THE PERFORMANCE OF LEVEL FIVE HOSPITALS: A SURVEY OF SELECTED LEVEL FIVE HOSPITALS IN KENYA

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Abstract

The main objective of the research study was to establish the effects of technology adoption on the performance of level five hospitals in Kenya. This is because Health Information Technology supports and secures information exchange and management across all computerized systems in all health facilities. The specific objectives of the study were: to determine the influence of process automation, to assess the effect of telemedicine, to establish the effect of online record keeping and to investigate the extent to which mobile application uptake has affected the performance of level five hospitals in Kenya. The study adopted a descriptive survey research design and the target population consisted of staff members from four level 5 hospitals. Through random sampling technique a sample size of 95 respondents was obtained. Questionnaires were used as data collection instruments. The data was analyzed using SPSS software and findings presented by tables. The study concluded that level five hospitals in Kenya had automated their management systems, mobile application uptake was high and had no much use of telemedicine in those hospitals and had not invested in record management systems to a great extent. The study recommends that the government should encourage public hospitals to

increase their automation and make use of telemedicine to enhance service delivery. It also recommended a study on use of telemedicine and also on performance of level five hospitals from the patients' perspective need to be carried out.

Keywords: Process Automation, Online Record Keeping, Telemedicine, Mobile Application Uptake, Level Five Hospitals Performance, Kenya

INTRODUCTION

Hospital technology, for the purposes of this research work, is defined as high-technology clinical equipment and services designed to solve certain human health problems, improve human health conditions or improve diagnostic accuracy (Zengul et al, 2014). Technology is the collection if skills, techniques, methods and processes used in the production of goods and services or in the accomplishment of objectives. Thus, technology is a tool through which innovations can be explored and realized. An innovation is defined as a new idea or a substantially improved new product or service that has been marketed or any substantially new process improved for the commercial production of goods and services. Health information technology (HIT) is information technology applied to health and medical care. It is compatible with the management of health information through computerized systems and the secure exchange of health information between consumers, suppliers, payers and quality monitors (Tate & Laura, 2013). Thus, technology adoption means the choice to acquire and use new ideas or innovation.

Globally, the use of electronic medical records (EMR) is still low, but is increasing in primary care in countries like Canada, the United States and Great Britain. Information on medical care in EMRs is an important source for clinical, research and policy issues. Privacy of health information (HIP) and safety have been a major concern for patients and providers (Zeleny and Milan, 2009). For instance, the Unites States (U.S) has adopted Computerized Physician Order Entry (CPOE) systems which are widely regarded as the technical solution to medication ordering errors, the largest identified source of preventable hospital medical errors (Kidholm et al 2012). However, according to Wood (2013), only fewer than 15% of hospitals in the U.S have fully implemented these CPOE systems.

In the United States, hospitals have faced increasing challenges to improve their clinical and financial performance. Some of these challenges stem from efforts to control the increase in hospital costs. As a result of legislative pressures, paying for performance initiatives, quality improvement and other external pressures, hospitals are looking for ways to improve their

performance (Mohnen & Hall, 2013). Because technology represents a high percentage of hospital capital investment, it has long been identified as an important factor for clinical and financial performance. About 50% of the hospital's capital investment is spent on technological improvement initiatives. Hospital technologies such as minimally invasive surgery and cardiac catheterization have improved the quality of care, reducing recovery times and mortality (Tate & Laura, 2013).

Studies in Europe that evaluate electronic medical information show that the traceability features of the software allow hospitals to collect detailed information on the dispensed preparations; creation of a database of each treatment that can be used for research purposes. Based on a report often cited in 2008 on a small number of studies conducted at four sites providing outpatient care, three US medical centers and one in the Netherlands, the use of electronic medical records (EHR) the most promising tool was considered to improve the overall quality, safety and efficiency of the health care system (Sewe, 2014) .

South Africa has tested different strategies to improve access, quality and profitability in healthcare systems. Hospitals in South Africa have adopted MEDITECH, a program that provides a comprehensive and integral electronic health record (EHR) system designed to help organisations increase patient safety, streamline processes and improve communication across departments and care teams.   However, it is clear that the optimal approach has not yet been found. It has been recognized that health technology is an important element of this transformation and will continue to play a vital role (Kathithi, 2016). It is almost obvious that the way health technologies are managed in health institutions directly affects the quality of treatment received by patients.

In East Africa, the role of the public and private sectors in spurring innovation, challenges the health finance market in Kenya and Uganda, and the innovation environment and support systems are currently existing in the two countries. This has a number of implications for health care providers, investors in the region and government entities, such as the value of partnerships with the public sector to scale innovation in health care in East Africa and the opportunities that exist in the digital healthcare space that requires the connection of the points between the health and technology industries (Munge, 2012).

Internet penetration rate in Kenya in 2015 was 69.6%, exceeding global and African rates by 48.6% and 28.1%, respectively. Studies have shown that one third of the population (16 million people) have access to at least one mobile device. The use of mobile devices complements current hospital visits and will replace these physical interactions in the future, helping to alleviate the congestion of health facilities and to overcome the limits of geographical barriers. Kenya has already seen numerous mHealth products, including Daktari, medAfrica and

Sema Doc, but there is room for more players, especially in terms of preventive health, fitness and financial solutions. Interestingly, existing products date back a lot to their mobile service providers, insurance companies and even banks (Beauregard and Robert, 2012).

There are twelve level 5 hospitals in Kenya that are the point of reference for district / level 4 hospitals. Kenya's Level 5 hospitals are regional centres that provide specialized care, including intensive care, life support and specialized counseling. Level 5 hospitals in Kenya are struggling with insufficient funding and therefore provide lower standard reference services to the patients. For instance, in the financial year 2012/13, the amount of funds allocated for these hospitals was around Sh7 billion. After the devolution, this amount was reduced to Sh3.4 billion and was granted as conditional concession to the counties where the hospitals are located. In the last two years, this subsidy has been gradually reduced and now is at an average of 2 billion shillings per year (Leander, 2013).

The Kenyan health agenda seems to focus more on disease-centred programmes, maternal and child health, HIV, malaria, Tuberculosis and immunizations; diseases which account for an overwhelming majority of deaths in the country. Unfortunately, this is done at the expense of broader health system strengthening programmes like infrastructure, financing, medical equipment and digital health. Digital healthcare requires significant initial investment to purchase, install and maintain issues which have seen technology adoption rate being low in Kenya due to little funds allocation to the same.

Cudworth and Hobden (2013) studied the determinants of technological innovation and its effect on hospital performance. The study found that the hospital scale positively affects technological innovation, the level of technological innovation of private hospitals is higher than that of public hospitals and the technological innovation of non-university hospitals is significantly higher than that of hospitals.. Hahn & Powers (2010) conducted a study to determine the effect of research and innovation strategies on the competitiveness of the Aga Khan University Hospital, in Nairobi, Kenya. The study found that the hospital supports innovation through the continuous acquisition of updated equipment. Zahra and George (2012) conducted a study to determine the effect of ICT adoption on health care performance in Kenya. The study found that the successful adoption and use of ICT in hospitals contributed positively to the performance of these hospitals.

Technological innovation in the health sector in Kenya continues to experience poor acceptance despite the progress of technology in various sectors of the economy. Some studies have been carried out on technology adoption in the health sector, but none has been done specifically to establish the effects of technology adoption on the performance of level five hospitals in Kenya which informs the current study. The study focused on four variables,

namely: process automation, online record keeping, telemedicine and mobile application uptake.

Statement of the Problem

Over the years, there has been an upward trend of technology adoption in developing countries, Kenya included, whereby many industries ranging from banking, insurance, telecommunication and many more have embraced technology. Kenya's embrace of technology can be seen even in the public sector, with e-government services helping provide access to services previously burdened by laborious manual processes and red tape. These include services like acquisition of drivers' licence, Identification cards among others. On the same breath, the Kenyan public health care has also embraced technology though it has not reached its optimum level.

Technologies like mobile and internet that have a high penetration rate in Kenya can help improve access to medical services. Kenya has been at the forefront in adoption of mHealth, which are health solutions through the mobile phone. The ratio of doctors to patients in Kenya is much lower than the World Health Organization's recommendation which is 1:1000; while in Kenya the ratio is 1 doctor to 10,000 patients (2015 Kenya Health Workforce Report). This means that the Kenyan doctors are over worked since the country depends to a large extent on face to face human interaction. As such adopting mHealth can help free up congested health facilities from dealing with non-life threatening conditions to allow more time to provide better care to patients that require more critical care. Adopting new technology in hospitals will create new models of services that connect patients to the care network and facilitate continuity of care anywhere, anytime. It will allow consultations between patients and healthcare professionals through video and chat, as well as ensuring preventive care by monitoring applications and physical conditions. By addressing accessibility and affordability, mHealth is already changing the way people seek for information, saving on health care costs and taking care of their bodies (Crane, 2011).

Just like any other developing country, Kenya is having challenges with affordability of care. As such, the Kenyan health system is currently struggling to cope with the rising demand for quality health care services against the backdrop of a shortage of skilled health care professionals. This study therefore seeks to establish the level at which level five hospitals in Kenya have adopted technology and how technology has affected their performance.

Purpose of the Study

The general objective of this study was to establish the effects of technology adoption on the performance of level five hospitals in Kenya

THEORETICAL REVIEW

This section deals with the theories related to technological adoption on performance of level 5 hospitals. They include: Technology Acceptance model, Diffusion of Innovation Theory, Complexity theory and Actor Network Theory.

Technology Acceptance Model

This model was developed form Theory of Reasoned action by Fred Davis in 1989. This theory is one of the most influential extensions of Ajzen and Fishbein's Theory of reasoned action in the literature. It is an information systems theory that models how users come to accept and use technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it. This theory is relevant to this study as it shows that level five hospitals in Kenya have adopted technology and the staff in these hospitals have accepted to use the new technologies appropriately.

Diffusion of Innovation Theory

The Diffusion of Innovation theory (DOI) is a popular model used in information systems investigations to explain the adoption of new technologies by users. This theory was developed by Everett Rogers in 1962. It seeks to explain how, why, and at what rate new ideas and technology spread. Rogers defines diffusion as "the process by which an innovation communicates through certain channels over time among the members of a social society". An innovation is an idea or object that is perceived as new.

According to the DOI, the diffusion rate is influenced by the relative advantage, complexity, compatibility, triage capacity and observability of an innovation (Bovee & Thill, 2013). Dang (2011) defines the relative advantage as "the degree to which an innovation is considered superior to its predecessor". The complexity, which is comparable to the construction of perceived ease of use, is "the degree to which the prospective adopter believes that an innovation is relatively difficult to use and understand". Compatibility refers to the "degree in which an innovation is considered compatible with the values, beliefs, experiences and needs of existing adopters". Trialability is the "degree in which an idea can be experienced in a limited way".

Finally, observability is the "degree to which the results of an innovation are visible" (Jordie, 2015). This theory is relevant to this study because it explains why hospitals adopt technological innovations. One of the reasons why hospitals adopt technical innovations is the relevant advantage. This means that hospitals that adopt technological innovations have a financial advantage that is comparatively better than those that do not.

Complexity theory

The theory of complexity is an interdisciplinary theory that emerged from the systems theory in the sixties. It is based on the research of natural sciences that examines uncertainty and non-linearity. The complexity theory emphasizes the interactions and feedback circuits that constantly accompany and change systems. Although it proposes that systems are unpredictable, they are also limited by rules for order generation. The theory of complexity and of organizations, also called complexity strategy or complex adaptation organizations is the use of the study of complexity systems in the field of strategic management and organizational studies (Aduda & Kingoo, 2012).

Areas of application include understanding how organizations or companies adapt to their environments and how they deal with uncertainty. Organizations have complex structures as they are dynamic networks of interactions and their relationships are not aggregations of single static entities. They are adaptive; in the sense that individual and collective behavior is altered and self-organized in correspondence with a micro event or collection of events that initiates change. The theory of complexity on the theme of innovation, providing new computational knowledge about the emergence of complex architectures and the development of technological paradigms (Bovee and Thill. 2013). This theory can be used in understanding how organizations or firms adapt to their environments and how they cope with conditions of uncertainty. This theory is relevant to this study because as the hospitals embrace technology in their activities, they are able to ensure order in their work and be able to keep records of the same. It also explains how the hospitals have

Actor Network Theory

The actor-network theory (ANT) is a theoretical and methodological approach to social theory in which everything that exists in the social and natural world exists in ever-changing networks of relationships. This theory was developed by science and technology studies scholars Michel Callon and Bruno Latour and a sociologist John Law in the 1980s. It argues that nothing exists outside of these relationships. All the factors involved in a social situation are at the same level and, therefore, there are no external social forces beyond what and how the participants of the network interact at the moment. Therefore, objects, ideas, processes and any other relevant factors are considered important in the creation of social situations as human beings. ANT argues that social forces do not exist in themselves and therefore cannot be used to explain social phenomena. Instead, a strictly empirical analysis must be performed to "describe" rather than "explain" social activity (Crane, 2011).

The ANT seems to reflect many of the concerns of French post structuralism and, in particular, a concern for semiotic and non-foundational and material-material relationships. At the same time, it was much more firmly rooted in the academic traditions of the English language than most of the approaches influenced by post-structuralists. Its foundation in science and technology studies was reflected in an intense commitment to the development of the theory through qualitative empirical study cases. Their ties with the work largely originated in the United States on large technical systems have reflected in their willingness to analyze large-scale technological developments in an impartial manner to include political, organizational, legal, technical and scientific factors. Many of the functions related to ANT tools (including translation notions, symmetry and generalized "heterogeneous network"), along with a scienciometric tool to map innovations in science and technology ("word analysis") were initially developed during the late 1980s predominantly in and around the CIS. There was a movement to introduce the network theory of actors as an analytical tool for a variety of disciplines applied outside of sociology, including nursing care and public health. The stakeholder network theory can be used when integrating electronic health record systems (Cudworth & Hobden, 2013).

EMPIRICAL LITERATURE

In the past, there have been several empirical studies relating to the effects of technological innovation on the performance of five-level hospitals. Some of these studies include: Douglas et al (2011) studied the effectiveness of quality health care strategies in improving the provision of services in National referral hospitals in Kenya. The objectives of the study were: to establish how infrastructure affected provision of services in referral hospitals in Kenya, to establish the extent to which hospital capacity affects service provision in referral hospitals in Kenya, to assess the influence of health information system on service provision in referral hospitals in Kenya and to investigate how availability of financial resources affect performance of referral hospitals. The results of the study showed that the implementation of ICT in hospital operations had a significant positive correlation with process measures, in the time taken to discharge the patients.. Quality audits and quality circles, staff engagement, awareness and staff training were considered critical factors for quality improvement initiatives. However, respondents stated some challenges which they faced in institution such as staff shortages, inadequate facilities, staff attitudes, inadequate funds, poor maintenance of facilities, inadequate computerization of services, slow response from support departments, the inability of some patients to pay for services and congestion in the rooms. ICT adoption in health care has led to better clinical outcomes and customer satisfaction, which corroborates the effectiveness of quality health strategies to improve the provision of services in national reference hospitals. This study is

related to the current study in that it seeks to investigate the influence of process automation, online record keeping, telemedicine, as well as mobile application uptake on the performance of level 5 hospitals in Kenya.

Giesler and Markus (2012) examined the use of hospital management information systems among health workers at Mater Hospital and Kenyatta National Hospital. The objectives of the study were: to evaluate the use of the Information Communication Technology system in both hospitals, to establish to what extent the software system provides accurate and relevant patient information. The health information system is concerned with data quality and is characterized by the relevance, accuracy, timeliness and integrity of the data, while the health system's performance focuses on decision-makers who consider explicitly informing the formulation of policies, planning, management and supply. The findings of the study established that the hospital information management system in both hospitals provide accurate and pertinent patient information and other useful information needed to effectively manage patient care and to manage the health facility well. The study also established that modern and sufficient communications equipment and information is required for the system to deliver the desired results. The training of health professionals and continuous support are also of the utmost importance according to the results of the study. This study is relevant to the current study in that it seeks to address the issues of process automation and online record keeping and how they affect the performance of hospitals.

Hahn and Powers (2010) analyzed the effect of technological automation and the maturity of integration in hospital quality scores in US hospitals. The objective of this study was to assess whether the level of PACS maturity, conceptualized as the level of automation and integration attained, is related to broader hospital performance measures. The study found that the level of cardiological integration had a significant effect on hospital efficiency; while the level of radiological integration had a significant effect on patient experience and patient outcome scores, while the level of radiological integration had a significant effect on patient experience and result scores. Post hoc tests found that each of the three different levels of maturity was significantly different from each other. The results suggest that high levels of automation and integration with other hospital information systems have a positive effect on hospital quality. This study is relevant to the current study which sought to establish the influence of process automation on the performance of level five hospitals in Kenya.

Hochbaum and Dorit (2011) studied the development of telemedicine systems in the health system of Kenya. The study objectives were: to identify the issues that affect the adoption of telemedicine technology in developing countries, to develop a conceptual framework for telemedicine deployment through organisation collaboration to promote a guideline

framework for the Kenyan healthcare sector and policy makers, to demonstrate that the framework on the adoption of telemedicine devised during these research can support the analysis of healthcare collaborative innovation performance, to validate the conceptual framework developed by evaluating it in the context of the deployment of telemedicine deployment by conducting interviews. The results of this research revealed that Kenya's hospitals collaborate with other organizations primarily to reduce the limited budget suffered during the technological innovation process. Furthermore, it was revealed that affiliation to an organization could improve their ability to adopt telemedicine. It was noted that affiliation of the organization significantly influences the organization's resources, the acceptance of the organization's innovation, the organization's innovative capabilities, the agility of the organization and the aspects of collaborative innovation. The study also showed that acceptance of innovation by staff has not had a significant effect on the results of collaborative innovation. The study relates to the current study as it sought to establish whether telemedicine was adopted in the Kenyan Health sector. Likewise, the current study sought to establish how telemedicine has affected the performance of level five hospitals in Kenya.

Jordie (2015) tried to highlight another dimension of cell phone technology and explores how this device can be used to promote health in developing countries where medical care is often scarce and underdeveloped due to multiple factors such as deficient and insufficient medical personnel infrastructure. The study objective was to identify the effect of cost, improvement of healthcare on the use of cell phone technology. The research was carried out in Kenya and the data used were collected from the general public. So it was refined and subjected to statistical analysis to draw more complete conclusions.. This research addressed the problem from a user / public perspective and sought to uncover problems that are critical to implementing a successful m-health solution. The research focused not only on the technological aspect, but also on the behavioral aspect of the m-health technology. The study showed that at least 64% of mobile users had intention to adopt and use M-health. The study relates to the current study since the current study seeks to investigate how telemedicine and mobile application uptake affect the performance of level five hospitals in Kenya, aspects that were highlighted by this study.

Leander (2013) sought to establish the factors influencing the adoption of mHealth by focusing on maternal health at the Nakuru Provincial General Hospital. The study objectives were: to determine the influence of knowledge and awareness on the adoption of mHealth in maternal health care at Nakuru Provincial General Hospital (PGH), to establish the influence of the government policies on the adoption of mHealth in maternal health care at Nakuru PGH, to assess how access to mobile technology affects the adoption of mHealth in maternal health

care at Nakuru PGH, to establish the effects of ICT infrastructure on the adoption of mHealth in maternal health care at Nakuru PGH and to identify the cost aspects affecting the adoption of mHealth in maternal health care at Nakuru PGH. The results indicated that knowledge and awareness influence the adoption of mHealth in maternal health care. There was understanding of mHealth among hospital employees. Government policies influence the adoption of mHealth in maternal health care. The hospital did not have a policy to improve the integration of ICT in the provision of health services. Based on the findings on access to mobile technology and the adoption of mHealth in maternal health care, it was concluded that computers and computer accessories are correct, while internet connectivity was poor. There has been no promotion of government health policies on the use of mHeath. There were no government policies to guide the implementation of mHealth in the hospital. Government policies have not promoted the use of ICT in health care innovations. The cost aspects affect the adoption of mHealth in maternal health care. MHealth spending was not convenient for both the patients and the hospital employees. The study relates to the current study as it tries to show the effects of mHealth on healthcare issues which the current study also sought to investigate

RESEARCH METHODS

Research Design

The study adopted a descriptive survey design that guaranteed compilations and descriptive analysis of the data of the study population. Peil, (2005) defines descriptive design as a research project that determines and informs how things are and tries to describe things as possible behaviors, attitudes, values and characteristics. Zikmund (2010) defines a descriptive design as an intensive study of a single unit with the aim of generalizing larger units. Therefore, the researcher believes that the descriptive study research design was appropriate for the study, since the data was collected in level 5 hospitals. The research design allowed the researcher to highlight the effects of technological innovation in the performance of level five hospitals in Kenya.

Target Population of the Study

According to Peil, (2005), population is a complete set of elements (people or objects) that possess some common characteristics defined by the sampling criteria established by the researcher. The target population consisted of staff in four level five hospitals in Kenya, which are the Machackos level five hospital, Mama Lucy Kibaki level five hospital, Embu level five hospital and Thika level five hospital. Purposive sampling technique was applied in choosing the

hospitals. The four level five hospitals represent 30% of the total level five hospitals in Kenya which are twelve in number.

Table 1 Target Population

Level 5 Hospital	Doctors	Nurses	IT Staff	Record management staff	TOTAL
Machakos	50	200	3	8	261
Mama Lucy	40	170	4	9	223
Thika	44	180	6	5	235
Embu	38	150	7	7	202
Total	**172**	**700**	**18**	**31**	**921**

Source: County Health Sector Strategic Investment plan (2017-2022)

Sampling Procedure and Sample Size

According to Zikmund (2010), the sampling design refers to the part of the research plan that indicates how cases should be selected for observation. The study adopted simple random sampling technique to select respondents from each category since the population is heterogeneous. The sample size is shown in table 3.2; and the sample population was drawn from four different staff categories, i.e , IT staff, nurses, doctors and record management officers. According to Mugenda & Mugenda, (2003), the sample size should be between 10%-20% of the target population. The study selected 10% of respondents in each category from each hospital to get the sample size.

Table 2 Sample Size

Level Five Hospital	Doctors	Nurses	IT staff	Record management staff	Total (10%)
Machackos	5	20	1	1	27
Mama Lucy	4	17	1	1	23
Thika	4	18	1	1	24
Embu	4	15	1	1	21
Total	**17**	**70**	**04**	**04**	**95**

Data Collection instruments

Primary data was collected through questionnaires. The questionnaires were useful for gathering information on the effects of technological innovation on the performance of five-level hospitals in Kenya. The questionnaire had closed-ended questions. The questionnaire were divided into five sections ie; Section A, Section B, Section C, Section D and section E. It took a

period of three weeks to collect the required data because the institutions under study were in diverse areas and data was supposed to be collected from different categories within the four level 5 hospitals. The researcher used research assistants who assisted in distribution and collection of the questionnaires to and from the respective staff in the respective hospitals.

EMPIRICAL FINDINGS

Hospital Process Automation

The researcher wished to know whether the hospital processes are automated. The findings are in the table 3 below**.**

Table 3 Hospital Process Automation

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	83	92.2	92.2	92.2
No	7	7.8	7.8	100.0
Total	**90**	**100.0**	**100.0**	

From the table above, 92.2% of the respondents indicated that level five hospitals in Kenya have automated their processes, while only 7.8% respondents disagreed that they are automated. This implies that majority of level five hospitals in Kenya have embraced technology.

Extent of automation

The respondents were asked the extent to which they agreed or disagreed with the following statements regarding process automation where: *1 strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree and 5 strongly Agree.* The response was as in the table below.

Table 4 Extent of automation

	Mean	**Standard deviation**	**Variance**
The hospital has adequate computers	3.42	1.005	0.849
The hospital has networked all the computers in all departments	3.8	0.767	1.011
The hospital has installed relevant programmes in the computers	3.33	1.161	0.589

The findings above show that the spread of data set is low meaning that the data points are close to the mean hence the data on Inflation and investment decision used from the sample

distribution represents the population. This is indicated from the means which range from 3.23 to 3.8 as measures of central tendency while standard deviation and variance as measures of variability range from .96 to 1.18   and from 0.589 to 1.011 respectively. These results reveal that majority of level five hospitals in Kenya have adequate computers that are well networked in all departments and they have installed relevant programmes in those computers.

Online Record Keeping

The researcher wanted to know if the records of the hospitals are automated. The responses are tabulated as shown in the table 5.

Table 5 Hospital records automation

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	48	53.3	53.3	53.3
No	42	46.7	46.7	100
Total	**90**	**100**	**100**	

The table shows that 53.3% of respondents said that the hospital records are automated while 46.7% said they are not. This indicates that the records of level five hospitals have their records online.

Volume of the hospital records

The respondents were requested to indicate the volume of the hospital records. The information gathered was as follows.

Table 6 Volume of the hospital records

	Frequency	Percent	Valid Percent	Cumulative Percent
Large	44	48.9	48.9	48.9
Small	46	51.1	51.1	100
Total	**90**	**100**	**100**	

From the table above, 51.1% of respondents indicate that volume of the hospital records was large while 48.9% of the respondents indicated that the volume of hospital records was small. This reveals that Kenyan level five hospitals handle large volumes of hospitals records.

Training of record management staff

The researcher wanted to know whether the record management staff of the hospitals are trained. The data collected is tabulated in the table 7.

Table 7 Training of record management staff

	Frequency	Percent	Valid Percent	Cumulative Percent
70%-80%	13	14.4	14.4	14.4
50%-69%	37	41.1	41.1	55.6
30%-49%	22	24.4	24.4	80
Below 30%	18	20	20	100
Total	**90**	**100**	**100**	

The above table shows that 50%-69%, forming 41.1% of respondents felt that the record management staff of the hospitals are fairly trained. 30%-49% of staff which translates to 24.4% are trained while 14.4% say 70%-80% of staff are trained. Only 20% of respondents believed that 30% and below of staff have been trained. This indicates that more than half of the staff are well trained on online record keeping and can manage the records as required.

Record management system

The respondents were requested to indicate to what extent they think the level five hospitals have invested in record management systems as shown in the table below.

Table 8 Record management system

	Frequency	Percent	Valid Percent	Cumulative Percent
Very great extent	18	20.0	20.0	20.0
Great extent	49	54.4	54.4	74.4
Little extent	21	23.3	23.3	97.8
Not at all	2	2.2	2.2	100.0
Total	**90**	**100.0**	**100.0**	

From the table above, 54.4% of respondents think that level five hospitals have invested in record management systems to a great extent, 23.3% of respondents agree to a little extent, 20.0% agree to a very great extent while only 2.2% of respondents do not think that the level five hospitals have invested in record management systems. This implies that level five hospitals in Kenya have invested heavily in record management systems.

Use of Telemedicine

The researcher wanted to know whether there is use of telemedicine in the hospitals. The information gathered is tabulated in the table below.

Table 9 Use of Telemedicine

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	15	16.7	16.7	16.7
No	75	83.3	83.3	100
Total	90	100	100	

Table 9 indicates that 83.3% of respondents do not use telemedicine in the hospitals while 16.7% use telemedicine. This shows that telemedicine is not widely used in level five hospitals in Kenya.

Extent of use of telemedicine

The respondents were to indicate the extent to which they agree or disagree with the following statements regarding telemedicine; where *1 strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree and 5 strongly Agree.* The response was as follows in the table below.

Table 10 Extent of use of telemedicine

	Mean	Standard deviation	Variance
I have access to patients' medical records online	1.186	1.28	0.40
I am able to administer medicine to patients online	1.289	1.23	0.43
I can access patients in remote areas through the phone	3.04	1.14	1.301

The findings in table above show that the spread of data set is low meaning that the data points are close to the mean hence the data on Inflation and investment decision used from the sample distribution represents the population. This is indicated from the means which range from 1.186 to 3.04 as measures of central tendency while standard deviation and variance as measures of variability range from 1.14 to 1.28 and from 0.4 to 1.301 respectively

These findings reveal that majority of level five hospitals in Kenya have access to patients in remote areas through the phone but do not have access to patients' medical records

online. Moreover, the results show that most of the level five hospitals cannot access to patients' medical records online. This shows that level five hospitals in Kenya have not embraced telemedicine as a way to deliver services.

Mobile application uptake

The respondents were requested to indicate the gadgets they are using in the hospitals. The following table illustrates the response.

Table 11 mobile application uptake

	Frequency	Percent	Valid Percent	Cumulative Percent
Mobile phone	23	25.6	25.6	25.6
Tablet	11	12.2	12.2	37.8
Computer	56	62.2	62.2	100
Total	**90**	**100**	**100**	

From the Table above, 25.6% of respondents indicate that the gadgets they are using in the hospitals are mobile phones, 12.2% of respondents indicate the use of tablets, while 62.2% agree to use computers. This implies that computers are the most used gadgets in level five hospitals for service delivery.

Internet connectivity in the hospitals

The respondents were requested to indicate whether there is internet connectivity in the hospitals. The results are shown in the table 12.

Table 12 Internet connectivity in the hospitals

	Frequency	Percent	Valid Percent
Yes	87	96.7	96.7
No	3	3.3	3.3
Total	**90**	**100**	**100**

From the findings above, 96.7% indicated that there is internet connectivity in the hospitals while 3.3% indicated there is no internet connectivity in the hospitals. This reveals that there is proper internet connectivity in level five hospitals in Kenya.

Means of internet services access in the hospital

The researcher wanted to know how the staff access internet in the hospital. The information is tabulated as below.

Table 13 Means of internet services access in the hospital

	Frequency	Percent	Valid Percent	Cumulative Percent
There is Wi-Fi in the hospital facility	58	64.4	64.4	64.4
The hospital caters for the airtime	12	13.3	13.3	77.8
The hospital caters for internet services	20	22.2	22.2	100
Total	**90**	**100**	**100**	

From the findings in the table above, majority, 64.4% of the hospitals use Wi-Fi, while hospitals cater for 22.2% of internet services and only 13.3% of hospitals cater for airtime. This shows that majority of level five hospitals use Wi-Fi in their facilities to access internet services.

Performance of level five hospitals

The respondents were to indicate the extent to which they agree or disagree with the following statements regarding performance where *1 strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree and 5 Strongly Agree*

Table 14 Performance

	Mean	Standard deviation	Variance
There is increased accuracy in Billing	0.03	0.814	0.662
Technology has reduced time spent by the patient in the hospital	0.97	3.53	1.830

The findings above show that the spread of data set is low meaning that the data points are close to the mean hence the data on Inflation and investment decision used from the sample distribution represents the population. This is indicated from the means which range from 0.03 to 0.97 as measures of central tendency while standard deviation and variance as measures of variability range from 0.814 to 3.53 and from 0.663 to 1.830 respectively. This means that

process automation, online record keeping, telemedicine and mobile application uptake have led to increased accuracy in billing as well as reduction in service period, since the means and standard deviations are within the acceptable range.

Regression Analysis

The researcher sought to establish the effects of technology adoption on the performance of level five hospitals in Kenya. Variables that were considered for the study were process automation, online record keeping, telemedicine and mobile application uptake on the performance of level five hospitals in Kenya. These variables were analysed by use of SPSS as below.

Table 15 Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	-1.142	.224		-5.105	.000
	Process automation	.456	.048	.536	9.503	.000
1	Online record keeping	.319	.103	.355	3.081	.003
	Telemedicine	.084	.042	.090	2.008	.048
	Mobile application uptake	.126	.105	.134	1.207	.031
a. Dependent Variable: Performance of Level Five Hospital						

The findings in table 15 above show the regression coefficients that reveals the relationship between the independent variables and the dependent variable as shown by the regression formula: Y (performance of level five hospital) = -1.142 +.456 (process automation) +.319 (online record keeping) + .084 (telemedicine) + .126 (mobile application uptake). Hence, the regression equation established was: $Y = -1.142 +.456X_1 +.319X_2 + .084X_3 + .126X_4$. Holding at 95% confidence level to a constant zero, performance of level five hospital would stand at -1.142 and a unit increase in process automation would lead to an increase in performance of level five hospital by a factor of 0.456 while a unit increase in online record keeping, telemedicine and mobile application uptake would lead to unit increases in performance of level five hospital by factors of .319, .084 and .126 respectively.

The above research findings show that performance of level five hospitals would have the highest improvement in their performance if process automation was implemented since it has the highest factor of .456. This is followed by online record keeping factor .319, mobile

application uptake Factor .126 and lastly, telemedicine factor 0.084. The findings also indicate that all the coefficients are positively correlated and significant at 0.05 level of significance given that the p-value (0.000) is less than alpha (0.05).

Table 16 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.926[a]	.858	.851	.491

a. Predictors: (Constant), Mobile application uptake, Telemedicine, Process automation, Online record keeping

The study findings in table show that r square is .858 indicating that 85.8% of the variations in the performance of level five hospital are caused by the independent variables while 14.2.% are caused by other factors not accounted in the study. R is the correlation coefficient or determination which shows the relationship between the study variables. From the findings, the study found that there was a strong positive relationship between the study variables as shown by .926. The adjusted r squared 0.851 indicate that if population was used rather than a sample then the variation in the performance of level five hospital would be 85.1%.

Table 17 Anova[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	123.606	4	30.901	128.164	.000[b]
	Residual	20.494	85	.241		
	Total	144.100	89			

a. Dependent Variable: Performance of Level Five Hospital

b. Predictors: (Constant), Mobile application uptake, Telemedicine, Process automation, Online record keeping

The findings in table above shows that the regression model generated is significant at 0.05 level of significance given that the p-value (0.000) is less than alpha (0.05) as indicated by the Anova table. This shows that sample data used was ideal for making conclusions about the population as it is less than 5% and had no negative significant variances that could affect the results.

Table 18 Correlations

		Performance of Level Five Hospital	Process automation	Online record keeping	Tele medicine	Mobile application uptake
Pearson Correlation	Performance of Level Five Hospital	1.000	.854	.799	.739	.791
	Process automation	.854	1.000	.619	.211	.611
	Online record keeping	.799	.619	1.000	-.135	.975
	Telemedicine	.139	.211	-.135	1.000	-.129
	Mobile application uptake	.791	.611	.975	-.129	1.000
Sig. (1-tailed)	Performance of Level Five Hospital	.	.000	.000	.096	.000
	Process automation	.000	.	.000	.023	.000
	Online record keeping	.000	.000	.	.102	.000
	Telemedicine	.096	.023	.102	.	.112
	Mobile application uptake	.000	.000	.000	.112	.
N	Performance of Level Five Hospital	90	90	90	90	90
	Process automation	90	90	90	90	90
	Online record keeping	90	90	90	90	90
	Telemedicine	90	90	90	90	90
	Mobile application uptake	90	90	90	90	90

*. Correlation is significant at the 0.05 level (1-tailed).

The findings in table 18 above shows that there is a strong positive correlation between technology adoption and performance of level five hospital (r=1). From the table above, research findings show that all the four variables mobile application uptake, telemedicine, process automation, online record keeping have strongly correlated as shown by the values

.791 .739 .854, and .799 respectively in the table. The findings also indicate that the correlation is significant at 5% significance level given that p-

CONCLUSION

Process Automation and performance of level five hospitals in Kenya

According to the findings, the study reveals that level five hospital in Kenya have automated their processes to a greater extent and these hospitals have adequate computers and have networked their computers and installed them with relevant programmes for good service delivery. It can therefore be concluded that level five hospitals in Kenya have adopted technology by automating their management systems which have enhanced their performance.

Online Record Keeping and performance of level five hospitals in Kenya

From the research findings, the study shows that large volume of level five hospitals' records are automated to capture all the details of all the patients and access them online. It also shows that record management staff of the hospitals are well trained to manage the records. However the results reveal that most hospitals have not invested in record management systems sufficiently. This study therefore concludes that the large volumes of record in level five hospitals are automated, and that the staff are trained though level five hospitals in Kenya have not invested in record management systems to a great extent. Thus this reveals that to a greater extent, level five hospitals in Kenya have online record keeping which impacts positively on their performance.

Use of telemedicine and performance of level five hospitals in Kenya

The study found that most level five hospitals in Kenya are using computers and mobile phones in delivering services. It also showed that majority of level five hospitals in Kenya do not have access to patients' medical records online and cannot administer medicine online. However, most patients can be accessed in remote areas of the country through the phone.Therefore this study concludes that there is no much use of telemedicine in level five hospitals in Kenya and their staff have no much access to patient's medical records online. It can also be concluded that most Kenyans own phones hence making it easy for the doctors to reach the patients with manageable diseases which impacts positively to performance of level five hospitals in Kenya.

Mobile application Uptake and performance of level five hospitals in Kenya

The study revealed that majority of level five hospitals in Kenya use Wi-Fi and a few use internet services and only very few use airtime through mobiles in their hospital facilities. The study also

revealed that most gadgets used in level five hospitals in Kenya are computers and that there is a lot of internet connectivity in these hospitals in Kenya. This study therefore concludes that the uptake of technology by level five hospitals in Kenya is high and which in turn helps the hospitals to offer quality services as they can reference as well as conference using the internet services.

RECOMMENDATIONS

Policy Recommendations

The study recommends that the government should encourage all public hospitals to automate their processes in order to enhance their efficiency and effectiveness in service delivery. The study recommends that the hospital management in all public hospitals should ensure that there is proper networking of all the computers in all the departments and making available the necessary internet services to actualise technology adoption in hospitals which would in turn help in improving performance of the hospitals. Moreover, the study recommends that all hospital staff be fully trained in order to be able exploit the benefits that come with technology and its application in their work in order to improve on service delivery.

Practice Recommendations

The study recommends that level five hospitals in Kenya make use of telemedicine. This will ensure that patients are reached, enhance audio visual engagements, improve workflow and ensure medicines are administered.

Academia Recommendations

This study focused on hospital performance form the staff perspective; hence, it did not capture the views of the patients on the performance of level five hospitals. It is therefore recommended that a study be done on the performance of level five Hospitals from the patients' perspective whereby patients are included in the target population. In addition, there are many other factors that affect performance of level five hospitals other than those discussed in this study. This study, therefore, recommends that further studies be done on other variables that affect level five hospital performance and how they affect performance.

The study recommends a further research to be carried out to find out the level at which public hospitals have adopted telemedicine. The study also recommends a further study on the effect of staff computer training on performance public hospitals in Kenya. In addition, it is recommended that further studies be done on the other level five hospitals in Kenya to enable

proper generalization of the true state of the effects of technology adoption on the performance of level five hospitals in Kenya as well as for comparison purposes.

REFERENCES

Arendt, L. (2008). Barriers to ICT adoption in SMEs: How to bridge the digital divide: Journal of Systems and Information Technology, 10 (2), 93-108.

Ashrafi, S., & Murtaza, E. (2013). The Effect of Soft ICT Capital on Innovation Performance of Greek Firms, Journal of Enterprise Information Management, 26(6), 679-701.

Ayers, J. D. (2009). Adoption of electronic medical records: the role of network effects. Journal of Product & Brand Management, 18 (2), 127-135

Beauregard, Robert (2012). "Planning with Things". Journal of Planning Education and Research. 32: 182–190.

Bovee, J. K., & Thill M.N (2013) Business communication New York, NY: McGraw-Hill

Brown, P.B, Lauder, H.K and Ashton, D.R (2011) The Global Auction, Oxford, New York, Oxford University Press.

Crane L.M. (2011). Measuring Financial Performance: A Critical Key to Managing Risk National Crop Insurance Services, Inc.

Cudworth, E. and Hobden, S, 2013. "Of parts and wholes: International Relations beyond the human." Millennium: Journal of International Studies', 41(3), pp.430-450.

Dang, U. (2011). The Camel Rating System In Banking Supervision A Case Study. Arcada University of Applied Sciences. International Business

Donaldson, M. (2001). Phases of the Adoption of Innovation in Organizations: Effects of Environment Organization and Top Managers. British Journal of Management, 17 (3), 215-236

Douglas et al (2011). The Effectiveness of Quality Health care Strategies in Improving Service. Delivery at the National Referral Hospitals in Kenya

Giesler, Markus (2012). "The use of Hospital management information systems among health workers". Journal of Management. 76(6): 55–68.

Hahn, W.J & Powers. T.L. (2010). Strategic plan quality, implementation capability, and firm performance. Academy of Strategic Management Journal, 9(1), 63-81

Hochbaum, Dorit S. (2011). "Rating Customers According to Their Promptness to Adopt New Products". Operations Research. 59 (5): 1171–1183

Irwin JG, Hoffman JJ, Lamont BT. The effect of the acquisition of technological innovations on organizational performance: A resource-based view. Journal of Engineering and Technology Management. 1998;15(1):25–54.

Jordie V.N. (2015). "The Ultimate Marketing Automation Statistics Overview." Journal of Performance, (3), 58–71

Kombo M.N & Tromp P.H (2006), Research Methods, 3rd Edition, McGraw-Hill Publisher, New York, U.S.A. Publisher, New York, U.S.A.

Kothari, .C. R. (2006), Research Methodology: 1st Edition, Pitman Publisher, London

Leander, A., (2013). "Technological agency in the co-constitution of legal expertise and the US drone program." Leiden Journal of International Law", 26(4), pp.811-831.

Magutu, P. O., Mbeche, I. M., Nyaoga, R. B., Ongeri, R. N. & Ombati, T. O. (2010).Quality Management Practices in Kenyan Educational Institutions: The Case of the University of Nairobi. Management & Marketing, 4(2), 35–44

McCullen, N. J. (2013). "Multiparameter Models of Innovation Diffusion on Complex Networks". SIAM Journal on Applied Dynamical Systems. 12 (1): 515–532.

Mugenda & Mugenda, (2003).Research Methods: 2nd Edition, Published by ACTS, Nairobi, Kenya

Mugenda & Mugenda, (1999).Research Methods: 1st Edition, Published by ACTS, Nairobi, Kenya

Munge J. (2017) "Embracing Digital Healthcare in Kenya" Strategic Management Journal,7(2), 56-67

Peil S.K (2005). Research Methodology and Design, 5th Edition, Macmillan. Publishers, New York, U.S.A.

Olson, K.K Rahm, M.N & Swanson, M.M (2010). Market Forces and Changes in the Plant Input Supply Industry. Choices, 25(4), 6-11.

Ong, I. A. & Sugiono S.K (2013). Influence Analysis of Brand Image Differentiation Strategy, Product Quality and Price on Purchasing Decision at Cincau Station Surabaya. Journal of Marketing Management 9 (4), 122-138

Richard, L.N Oliver P.G & Mikhael, S.K (2009), "Digital Redemption of Coupons: Satisfying and Dissatisfying Effect of Promotion Codes", Journal of Product & Brand Management, 12(2)12 1- 134.

Romero, I. & Martine-Roman, J. A. (2012).Self-employment and innovation.

Exploring the   Determinants of Innovative Behaviour in Small Business. Research Policy, 41(1), 178-189.

 Rydin, Yvonne (2012). "Using Actor-Network Theory to understand planning practice: Exploring relationships between actants in regulating low-carbon commercial development". Planning Theory. 12 (1): 23–45.

Sewe, S.A. (2014) Perceived Factors Influencing Success of Marketing Activities of Universities in Kenya: A Case of Business Schools in Nairobi Journal of Marketing for Higher Education, 8(2), 29–35.

Spetz J, Maiuro LS. Measuring levels of technology in hospitals. The Quarterly Review of Economics and Finance. 2004;44(3):430–447.

Tate, Laura (2013). "Growth management implementation in Metro Vancouver: Lessons from actor network theory". Environment and Planning B. 40: 783–800.

Zengul F, Weech M R, Savage G T (2014). Technological Innovation and Hospital performance: A systematic review of the literature, pp 13-26

Zeleny, Milan (September 2009). "Technology and High Technology: Support Net and Barriersto Innovation". Acta Mechanica Slovaca. 36 (01): P 6–19

Zikmund, W., (2010).Business Research Methods 8th Edition. McGraw-Hill Publishers. U.S.A. New York.