The Role of ICT-Based Monitoring and Evaluation Systems in Infrastructural Development in County Governments: Empirical Evidence from Machakos County, Kenya

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Abstract

There exists knowledge gap in analysis of the influence of the general ICT-based M&E systems in county governments with a focus on data analysis and timely presentation to stakeholder, there an empirical gap in physical health infrastructural, road infrastructural development, market infrastructural development and sports infrastructural development ICT-based M&E. This study tried to fill the gap in knowledge by answering a question on what the role of ICT-based monitoring and evaluation systems in infrastructural development in county governments? The study used the Realist Evaluation Theory coupled with a descriptive design. The study was conducted in Machakos County, one of the 47 counties in the republic of Kenya with a target of both internal and external M&E contractors of the Machakos County Government since 2013 to 2022. The study used purposive sampling technique and census to select the study participants. Two forms of questionnaires were used to collect quantitative data; one for ICT departments and the other for M&E department of the County Government of Machakos. Interviews were used to collect qualitative data from the Heads of ICT and Project and Delivery M&E departments. The instruments were piloted at the county government of Kitui. Content validity of the instruments were assessed by experts while reliability was determined using Cronbach's Alpha to ascertain items' internal consistency (yielding r of at least 0.75). Descriptive and inferential statistics were used to analzyed quantitative data while the qualitative data was analzyed thematically. The study found that information and communication technology improvements had often led to new ideas. Because of technological progress, there were new methods, tools, and ways of doing things, as well as new opportunities and problems in infrastructural development in Machakos county government. In the construction industry, amenities like roads, bridges, and buildings were equipped with electronic sensors that could be accessed from afar and give information about access. Monitoring and evaluation (M&E) systems should be used by all sectors in the county to keep track of project progress, measure and evaluate project results.

Key words: *ICT-Based, Monitoring and Evaluation, M&E Systems, Infrastructural Development, County Governments*

Introduction

Many new instruments and approaches for monitoring and evaluation have been available over the last two decades. Advances in information and communication technologies have frequently fueled innovation. New procedures, tools, and approaches spurred by technological advancements have created new opportunities as well as new obstacles. Infrastructure such as roads, bridges, and buildings can be equipped with remotely accessible electronic sensors to offer information on access in the construction industry. The information can be utilized to figure out when and how infrastructure or services are utilized. Intelligent infrastructure, for example, can be used to track how many people are visiting hospitals or resource centers. Intelligent infrastructure can help with automatic monitoring and decision-making in specific circumstances. It is feasible to construct wells that self-report when they are broken, for example (Intrac, 2017).

Organizations and governments utilize monitoring and evaluation (M&E) systems all around the world to track progress, measure, and assess project outcomes. By increasing their monitoring and evaluation processes, organizations can increase their performance, effectiveness, and project success. Furthermore, various studies show that information and communication technology systems are required for monitoring and evaluation activities because the majority of government organizations do not use computerized

monitoring and evaluation systems, and those that do lack a systematic early warning mechanism of project progress (Mleke & Dida, 2020).

According to UNDP Global Pulse (2016), big data can frequently give real–time and continuous data, which is useful for tracking the progress of a program. Observing behavioral change also necessitates gathering data on processes (rather than just comparing two points in time). A number of big data and ICT resources are available to help. Mobile devices can record video and audio of meetings, work groups, and other elements of community life, which can be beneficial. Social media is also a thriving, abundant source of information. Another useful tool is social network analysis. Data of high quality is typically difficult to obtain, and the recording and interpretation process frequently involves a level of subjectivity that is difficult to manage.

Smart phones can now collect high-quality audio and video data, and analysis and interpretation software are fast improving. This can aid in the removal of reporting bias and subjective interpretation. Both big data and ICTs provide a variety of options for integrating data from various sources and formats. While big data can handle very huge data sets, ICTs can handle smaller data sets as well (UN Global Pulse, 2016).

According to Institute of Development Studies (2012), many systems now use a GPS tracking device to generate sanitation facility location coordinates, which are then analyzed using an Excel-based model and the findings shown as a color-coded map. Distinct countries have different innovations. An innovation does not have to be perfect, but it must match the country's environment; for example, smart phones may be useful for data collection in India, but they may not be in Angola. These ICTs can be useful instruments for informing intervention planning and design, as well as gathering data for successful advocacy and program planning in the sector. For example, near-real-time progress tracking can help with programming and course correction.

In a study conducted by Bernardi & Chiara (2011), it was found that HIV/AIDS surveillance situation in Kenya has changed dramatically during the last ten years. The creation of new integrated governance and monitoring mechanisms, such as the NACC and the national HIV/AIDS monitoring and evaluation framework, as well as the integration of data gathering tools at the National HIV/AIDS Programme, are among them. One would be tempted to think of these shifts as the emergence of new accepted practices guided by the reforms' new logic of integration. Nonetheless, the institutionalist viewpoint used in the case study research allowed us to go deeper. As a result, the continuation of old institutionalized behaviors marked by fragmented and centralized information systems has been revealed.

To overcome challenges in monitoring and evaluation, internal and externals practitioners are co-opting and slowly integrating user-friendly technologies in the systems they use to monitor and evaluate. While Machakos County Government has made progress in terms of implementing optimum monitoring and evaluation (M&E) methods, the sector is still grappling with how to best overcome important conceptual and practical hurdles. The ideal way to monitor and evaluate concepts and developments that are fundamentally abstract, complicated, and can only be observed over lengthy periods of time remains a question. The department is unable to collect data in a systematic and timely manner, process it in real time, and communicate it to all stakeholders in a user-friendly format (Corlazzoli, 2014).

Current research documented in the literature shows limited studies on the influence of M&E on infrastructural development…Most studies focus on general M&E and not on specific aspects such as ICT. M&E has also not been investigated for the county government of Machakos.

Through a keen presentation of currently available and potential technologies of ICT in M&E systems, this study sought to analyze the influence of ICT-based M&E systems in Infrastructural Development shedding light into technology solutions for practitioners to overcome long-standing M&E challenges. A number of studies have been conducted globally on the use of ICT-based M&E systems in different sectors, however most these studies targeted a specific ICT-based M&E solutions such as Geographical Information Systems (GIS) with a focus on data collection for M&E. However, there exists a knowledge gap in analysis of the influence of the general ICT-based M&E systems locally with a focus on data analysis and timely presentation to stakeholder, there an empirical gap in physical health infrastructural, road infrastructural development, market infrastructural development and sports infrastructural development ICT-based M&E. This study tried to fill the gap in knowledge in local studies in the same subject, through analyzing Machakos County Government Infrastructural Projects.

Literature Review

Gorgens & Kusek (2010) governments and organizations around the world are under continual and increasing pressure to be more responsive to demands for good governance, accountability and transparency, improved development effectiveness, and the delivery of tangible results from internal and external stakeholders. Stakeholders interested in greater performance include governments, parliaments, individuals, the private sector, non-governmental organizations (NGOs), civil society, international organizations, and donors. As the need for increased accountability and results has grown, so has the need for practical and usable results-based monitoring and evaluation systems to support policy, program, and project management. As part of their management toolkits,

governments and other organizations have a variety of tracking systems, including good human resource systems, financial systems, and accountability systems.

The World Bank (2013) found that M&E are clearly distinct, but they are also complementary. Monitoring provides information on where a policy, program, or project stands in relation to its aims and outcomes goals at any given time (and over time). It is illustrative. Evaluation provides data as to why aims and outcomes are being met or not. It investigates the relationship between cause and effect. Governments are not unfamiliar with monitoring and assessment systems. More than 5,000 years ago, the ancient Egyptians kept a close eye on grain and livestock production. Today's governments all do some form of monitoring and evaluation. Most companies keep track of their costs, revenues, employee levels, resources, program and project activities, goods and services produced, and so on.

Nirmala et al. (2017), opines that though monitoring and evaluation are complementary activities, they are separate due to the fundamental approach differences. Monitoring is carried out in accordance with the management model, with an emphasis on daily operations. To determine whether project objectives have been fulfilled or exceeded, evaluation use a research methodology. Interwoven activities, on the other hand, are the most effective. They can provide information that will assist decision-makers in determining the best course of action for the project's future or the direction of future projects when used together. Monitoring and evaluation findings should assist decision makers in deciding whether to continue the project as is or with some modifications, expand the project by increasing coverage, reproduce the initiative in a new context, or curtail the project and reallocate resources elsewhere. Decision-making requires both monitoring and evaluation systems, thus they should be included in project planning (Kumar et.al, 2017).

Governments and other organizations have a variety of tracking systems in their management toolkits, including good human resource management systems, financial management systems, and accountability management systems. They also require effective feedback systems. A results-based M&E system is simply a feedback system; it's a management tool for measuring and evaluating outcomes, as well as giving data for governance and decision-making. Many management systems lack a feedback component that allows them to track the effects of their actions. By giving feedback on performance as a foundation for future improvement, an M&E system provides decision-makers with an extra management tool (World Bank, 2013).

According to Azevedo, Ferreira & Leito (2007), with the rapid advancement of technology in the twenty-first century, economic society and life have changed dramatically. In this continuously changing and uncertain economic climate, promoting competitive advantages has become the most critical issue for businesses. Many studies have shown that technology adoption is the most critical instrument for businesses to sustain their competitive advantages. In a knowledge-based economy, a company's ability to increase its technological capability is critical to its existence.

Firms should establish appropriate approaches in this regard in order to successfully adapt new technologies in the logistics area, as well as to integrate logistics into corporate strategy in order to become even more competitive. Partners are pressuring a rising number of businesses to change their old management styles, both operationally and organizationally, and replace them with integrated systems that help boost the speed and fluidity of physical and information flows. They are investing in new ICT to achieve this level of integration (Azevedo, Ferreira & Leito, 2007).

Mleke & Dida (2020) have observed that, M&E technologies have been increasingly crucial in tracking and analyzing project progress in recent years. M&E track the progress of initiatives and determine if they are fulfilling their goals or heading in the right direction. According to recent studies, there has been an increase in the establishment of M&E awareness in both public and private organizations, as well as an increase in the number of institutions that provide M&E courses.

A study was conducted by The World Bank (2013), to aid development practitioners in evaluating and selecting ICT applications for monitoring and evaluation in rural projects, specifically in agriculture and forestry, with a focus on mobile technology for data collecting. It was found that data gathering can be difficult, especially in highly decentralized projects, and picking technology might be difficult due to the enormous number of possibilities and individual project needs. The study was written in response to a requirement for development practitioners to be able to keep up with evolving technology and find relevant routes for assessing and selecting technology to support monitoring and evaluation (M&E) and project outcomes.

Through the lens of agriculture and forestry initiatives, the report gave recommendations in selecting and applying technology for data collecting, monitoring, and assessment. It was a practical, in-depth look at how governments and development practitioners might use ICT to improve data collecting and monitoring and evaluation efforts in rural development initiatives and programs (World Bank, 2013). However, this study mainly focused on agricultural sector and though the findings can be applied to other sectors, this study greatly looked at assessment and selection of ICT solutions for M&E in rural projects with a keen interest on mobile technology for data collection.

Methods

The study used the Realist Evaluation Theory. Ray Pawson and Nick Tilley invented the phrase "realist evaluation" in their book of the same name (1997). The importance of CMO (Context, Mechanism, Outcomes) configurations in policies and programs is

emphasized in this methodological approach. The study adopted a descriptive design. The design was used to collect information that demonstrated and described the influence of influence of ICT-based Monitoring and Evaluation Systems on Infrastructural Development by the County Government of Machakos (Gakuu, Kidombo & Keiyoro, 2018).

The study was conducted in Machakos County, one of the 47 counties in the republic of Kenya. Machakos county is located between the latitudes of 0º 45’ South and 1º 31’ South, and the longitudes of 36° 45' East and 37° 45' East. The altitude of the county ranges from 1000 to 1600 meters above sea level. Machakos County, often known as 'Macha,' was Kenya's first capital city and is now an administrative county. Machakos Town, Mavoko, Masinga, Yatta, Kangundo, Kathiani, Matungulu, and Mwala are among the eight (8) constituencies that make up Machakos. Machakos Town is the county's administrative center.

This study targeted both internal and external M&E contractors of the Machakos County Government since 2013 to 2022 who had worked on various infrastructure projects specifically those in sports facilities, road construction, market facilities, health facilities. The study also targeted employees of the Project Delivery M&E department in the County Government office.

The study used purposive sampling technique. This research involved studying the whole Project & Delivery M&E and ICT departments of the Machakos County Government (Gakuu, Kidombo & Keiyoro, 2018).

Since the two departments combined have less than a 100 hundred employees, the researcher used census of the two departments in order to analyze the influence of ICT-based Monitoring and Evaluation Systems on Infrastructural Development by the County Government of Machakos in Kenya.

The main data collection instrument was questionnaire. Bhandari (2022) defines a questionnaire as a set of questions or items intended to collect information about respondents' attitudes, experiences, or opinions. Questionnaires are useful for gathering quantitative and qualitative data. The questionnaire contained both open-ended and close-ended questions (Bhandari, 2022). There were two forms of questionnaires; one for ICT departments and the other for M&E department of the County Government of Machakos. Interviews were used to collect qualitative data. According to George (2022), an interview is a qualitative research approach in which data is collected by asking questions. The Key Informant Interview was specifically targeting the Heads of ICT and Project and Delivery M&E departments which were done by the researcher.

A pilot study was conducted two days before the actual study at the county government of Kitui. This allowed the researcher to familiarize with the research plan and protocols within the County Government offices. To ensure content validity of the instruments, the researcher facilitated the data collection instruments review by the supervisor as well as used the feedback from the pilot study (Kothari, 2004) to edit the instruments accordingly. The researcher tested for reliability of the instruments by checking the consistency of results across parts of the test items.

Descriptive and inferential statistics were used to analzyed quantitative data. The data was tabulated for analysis with the help of Statistic Packages for Social Science Version 26. The data was outlined and summarized using percentages and frequencies. The qualitative data was analzyed thematically based on guiding research objectives and presented using verbatims.

Results

The principal goal of this research study is establishing the implication of ICT-based in monitoring and evaluation on infrastructure development in Machakos county. Respondents were given three choices depending on the nature of monitoring and evaluation conducted in their respective departments. According to Figure 4.6, over 69% of the respondents said that they used ICT based Monitoring and evaluation as well as both ICT based, and non-ICT based monitoring and evaluation technique. Just about 30% belonged to departments that stilled relied on non-ICT based monitoring and evaluation. From this outcome, the research observed that in as much as the culture of integrating ICT in monitoring and evaluation processes was popular, most departments opted to retain non-ICT methods or deploy both.

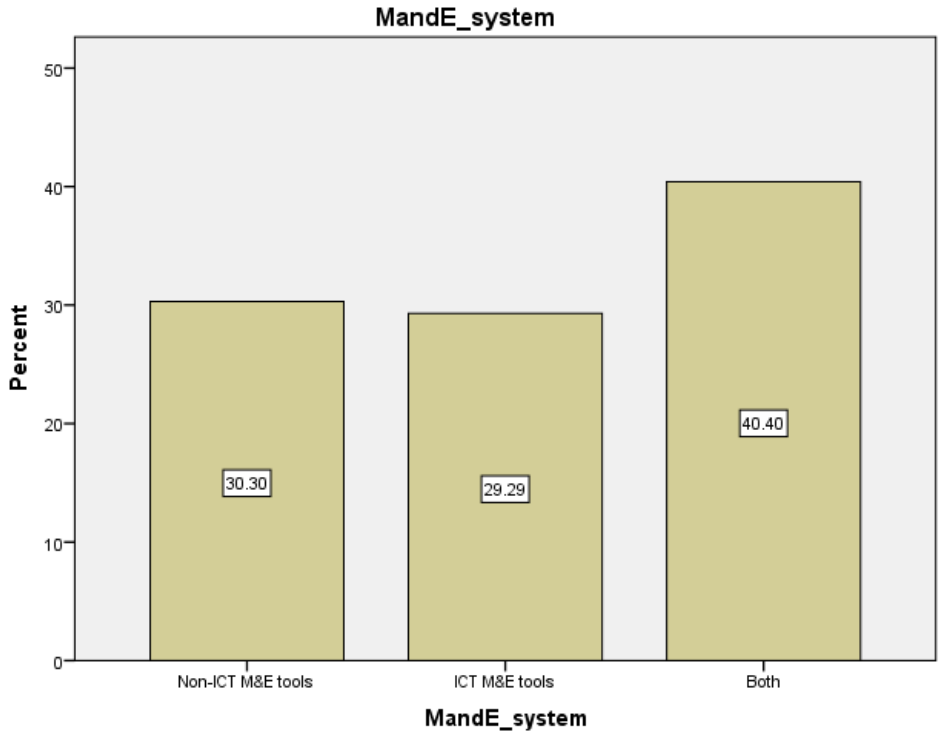

Figure 1 Distribution of M&E systems used

Scale of ICT integration

The responses collected on the scale of ICT integration in the respective department supported the hypothesis that many departments are embracing information technology in the execution of administrative and business functions. Over 70% of the respondents reported that the scale of ICT integration in their departments was either high or very high. Only around 8% and 2% said the level of ICT integration in their departments was low and very low respectively as presented on the bar chart below (See Figure 2). This distribution speaks to the crucial role technology plays in the daily function of any organization and the administrative wings of governance.

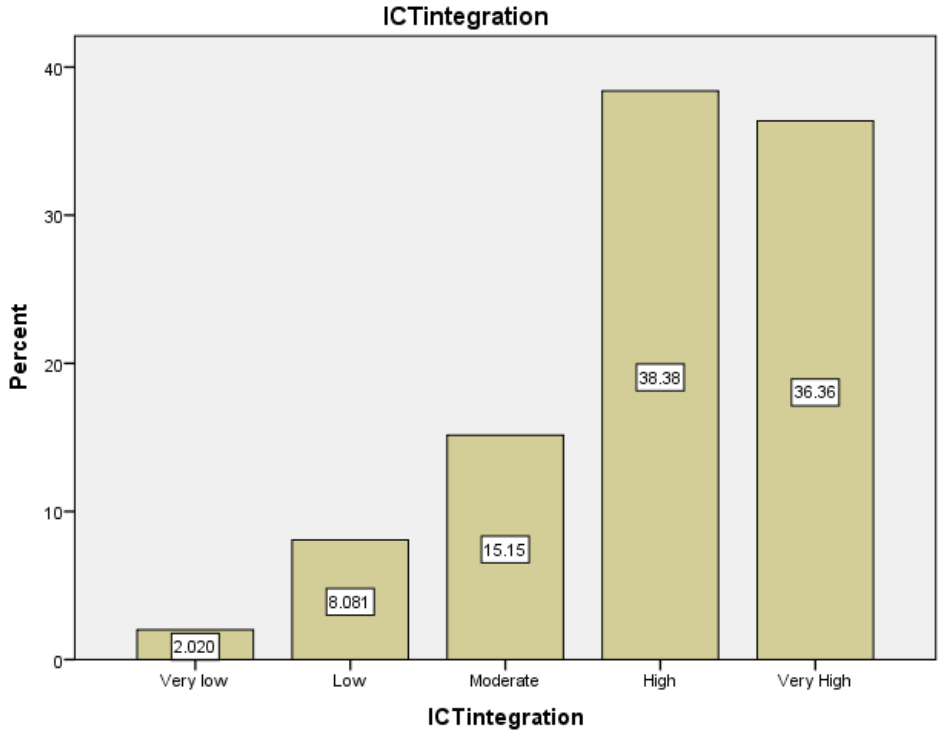

Figure 2 : Scale of ICT integration in departments

Data collection promptness

When asked to gauge the role of ICT-based monitoring and evaluation on market infrastructural development, 38.4% of the respondents strongly agreed that ICT based M&E led to systematic and timely data collection. A significant proportion (52%) agreed with these sentiments while just about 9% disagreed with those assertions according to the information displayed on Figure 4.8 below. From this outcome, it can be deduced that ICT based M&E plays a critical role in data collection processes. This is as presented in Figure 3.

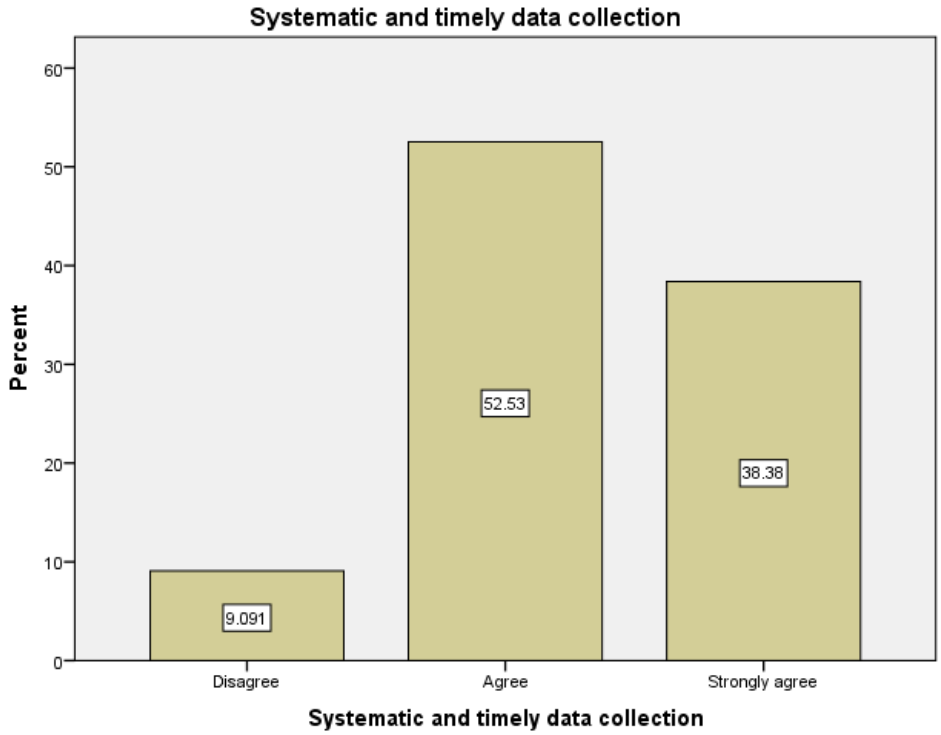

Figure 3 Role of ICT-based M&E on systematic and timely data collection

Realtime data processing

On the question of real time data processing, over 90% of the respondents said that they agreed or strongly agreed with the statement that ICT-based M&E promoted real time data processing. Those that disputed this were just about 8% as seen on Figure 4.9 below. This goes to show that ICT-based M&E place an extensive role in data processing across many different departments in Machakos County. This is presented in Figure 4.

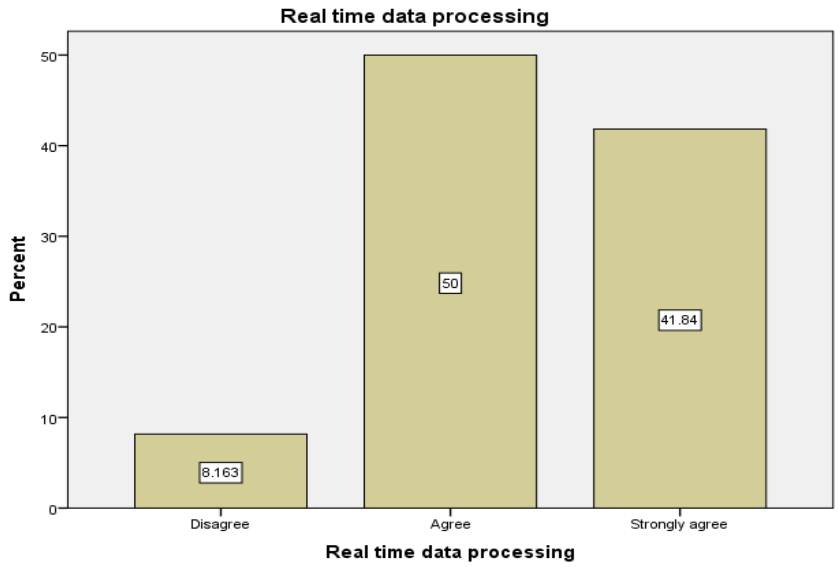

Figure 4 Role of ICT-based M&E on Real Time Data Processing

Efficiency of communication

ICT plays a very crucial role in enhancing efficient communication between parties, stakeholders and even different departments. On the question whether this was actually so in Machakos County, over 94% either agreed or strongly agreed that indeed this was so as illustrated on Figure 4.10. Of this massive chuck of the sampled respondents, 38% strongly agreed with the sentiments on the role of ICT-based M&E on enhancing communication efficiency. Only about 5% reported that they did not agree with the thoughts on impact of ICT based M&E on communication. Consequently, it can be asserted that many departments in Machakos County are reaping the benefits of ICT-based M&E on communication. This is as presented in Figure 5.

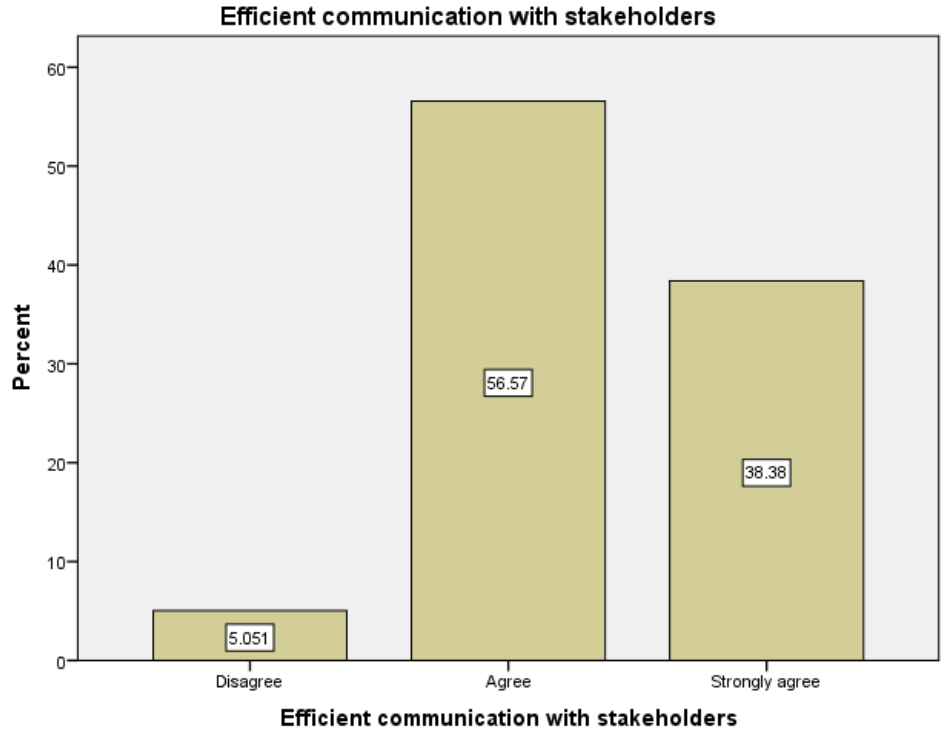

Figure 5 Role of ICT-based M&E on Efficient communication

Regression Model

The collected quantitative data was analzyed through regression modelling. The model summary of the regression in presented in Table 1.

Table 1: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.766	.587	.511	1.31789

The outcome of the linear regression analysis is as displayed in Table 1. The R squared statistics and the adjusted R squared statistics for the above model is 0.587 and 0.511 respectively. These statistics explain the magnitude of influence of the predictor variables on the explanatory variable. Approximately 58.7% of the changes in the infrastructure development ratings stated by the respondents can be attributed to the variations in the independent variable scores. The regression coefficients for each of the predictor variables are shown on Table 2.

Table 2 Regression Coefficients

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	1.289	1.164	-7.120	.000	-10.603	-5.974	.371
Systematic timely data collection	.527	.104	5.043	.000	.319	.734	.228
Real time data processing	.464	.104	4.485	.000	.258	.670	.190
Efficient communication	1.211	.117	1.802	.005	-.022	.445	.036
Safe data storage and ease of access	1.424	.078	5.471	.000	.270	.578	.258
Cost of technology	.433	.094	4.593	.000	.245	.620	.197
Technological simplicity	.403	.081	5.004	.000	.243	.564	.225
[M&E_system=1.00]	2.037	1.204	-1.343	.000	-.678	.131	.021
[M&E_system=2.00]	-1.273	2.207	-.177	.000	-.447	.374	.000
[M&E_system=3.00]	0[a]	.	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

The regression coefficients for each of the predictor variables are shown on Table 4.3 above. The relations;

Y_1= 1.29+0.53Sys +0.46DataP +1.21Comm+1.42Stor +0.43Tech + 0.38Cost+ 0.4Simp+ 2.04M&E+e ;

Y_2= 1.29+0.53Sys +0.46DataP +1.21Comm+1.42Stor +0.43Tech + 0.38Cost+ 0.4Simp -1.27M&E+e and

hold. All factors held constant, the average rating score on a scale of one to ten, assigned by an employee to the level of infrastructure development in the county was 1.29 as shown by the intercept coefficient. However, a unit increase in the scores for Systematic timely data collection, Systematic timely data collection, Real time data processing, Efficient communication, Safe data storage and ease of access, Cost of technology and Technological simplicity increased the infrastructure rating a respondent awarded the county by .527, .464, 1.211, 1.424, .433 and.403 respectively as expressed in Equation Y_1. These coefficients are statistically significant at both 95% and 99% level of confidence as indicated by the corresponding P value ($P<0.05$; $P<0.01$).

Equations Y_1, Y_2 and Y_3 have been expressed in order to bring out the effect size of the interactive variable which is the M&E system used in a particular department. The M&E system selected was either ICT-based (1), non-ICT-based (2) or Both (3). According to Equation Y_1, using the ICT-based M&E system increased the infrastructure rating by 2.04. In contrast, relying solely on non-ICT-based M&E system diminished the infrastructure development by 1.27. The outcome of the regression analysis is effectively illustrated on Figure 4.17 below. The average infrastructure development ratings awarded to the county was highest for respondents whose departments used the ICT-based M&E system, and lowest where the department relied exclusively on non-ICT-based M&E. The significant difference in the infrastructure ratings between the two system underscores the significance of the former in enhancing infrastructure development in the county.

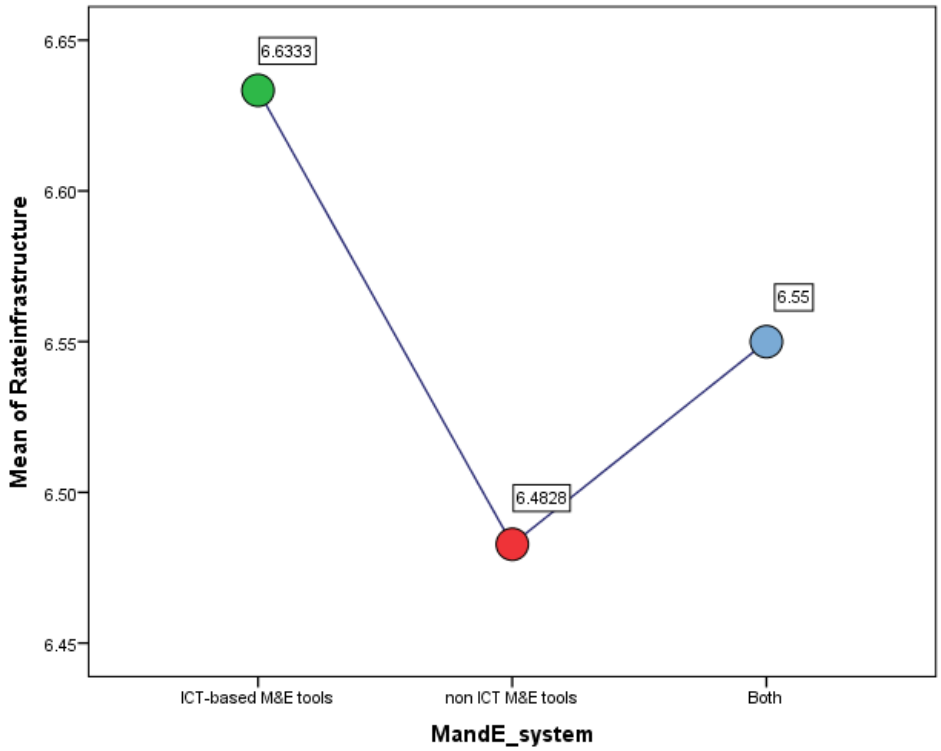

Figure 6 Mean plot for M&E systems

Discussions

The investigation into the influence of ICT-based Monitoring and Evaluation Systems on Infrastructural Development of Machakos county, Kenya, offers one of the most comprehensive insights relative to the work done by other researchers. Despite the disparity in the research done on the topic in the county, the feedback fROm the respondents indicated that ICT-based Monitoring and evaluation was not a new concept in the region. In fact, according to Figure 4.6, over 69% of the respondents said that they used ICT-based Monitoring and evaluation as well as both ICT-based and non-ICT-based monitoring and evaluation technique. Similarly, more than 70 % of the respondents concurred with the questions that suggested that the scale of ICT integration in their departments was either high or very high. Based on this feedback, the research is in a good position to speculate that ICT-based Monitoring has played a great role in the growth and development of infrastructure in Machakos county. Azevedo and Ferreira make similar speculation, and Leito (2007), according whom, the rapid technological advancements of the 21st century have forced governments and organizations to re-evaluate their archaic outlook on the world and adapt to the changes. Technology has been adopted in most organizations to keep up with the competition. Similarly, Mleke and Dida (2020) observe that M&E technologies have been increasingly crucial in tracking and analyzing project progress in recent years. Adopting this technology can be a significant game changer for Machakos' infrastructural development and the county's ability to compete with the other influential counties in the country, such as Nairobi and Mombasa counties.

The research found that incorporating ICT-based Monitoring and Evaluation Systems on Infrastructural Development of Machakos county had notable advantages. Figure 4.10 indicates that at least 90 % of the respondents found ICT essential in enhancing efficient communication between parties, stakeholders, and even departments. On a similar note, previous research found ICT integration into various organizations to be instrumental in improving aspects such as the quality of work and life of the stakeholders. According to the European Commission (2013), appropriate communication tools are a key strategy for improving healthcare communication and the health and well-being of older persons. The authors note that ICT can be one of the communication tools that plays that part.

Data collection promptness and real-time data processing were other advantages brought forth by the integration of ICT-based Monitoring and evaluation in the structural development of the county. According to figure 4.8, most respondents agreed that its

inclusion positively impacted the speed of the data collection process and the quality of the data obtained. Similarly, figure 4.9 showed that the questionnaires conjured up a 90 % response in favor of the ICT-based Monitoring and evaluation system. Their response suggested that the integration had a significant positive impact on data processing speed. According to Xuesong et al. (2008), data collection accuracy has increased immensely. For instance, the authors outline that resources used in the process can work with increased situation awareness applications that could aid construction site operations, thus, allowing for productivity assessment, waste reduction, and accident prevention.

Common infrastructural development in Machakos county that could benefit from ICT-based monitoring and evaluation systems include sports, health, road, and market infrastructure. Table 4.6 shows a strong positive relationship between ICT-based monitoring and evaluation systems and the infrastructure development rating. The positive relationship suggests that an increase in the rate of the incorporation of the ICT-based systems into the development of Machakos County will trigger a proportional increase in the infrastructural development of the county. Additionally, Table 4.6 shows that 58.7 % of the various infrastructural development in the country is subject to the incorporation of ICT-based monitoring and evaluation systems. As such, the research is inclined to speculate that the inclusion of an ICT-based system is advantageous to the infrastructural development of Machakos county. Recent studies by various authors show how ICT-based systems have positively affected the various infrastructure investigated in this research. For instance, Peyroteo et al. (2021) point out the important role ICT has played in improving the quality of healthcare delivery. The improvement was shown in droves during the COVID-19 outbreak as patients with chronic conditions, the elderly, and those recovering from SARS-CoV-2 benefited immensely.

Similarly, a study on the impact of ICT on market infrastructure by Lin et al. (2017) shares the sentiments of this research as it details the important role that ICT has played in agriculture by introducing e-agricultural systems with blockchain architecture. The new platform has given farmers access to knowledge on banks and other digital resources which is essential for the efficiency of sustainable agricultural development.

Conclusion and Recommendations

The study found that information and communication technology improvements had often led to new ideas. Because of technological progress, there were new methods, tools, and ways of doing things, as well as new opportunities and problems in unfractured. In the construction industry, amenities like roads, bridges, and buildings were equipped with electronic sensors that could be accessed from afar and give information about access.

Monitoring and evaluation (M&E) systems were used by the Machakos county government all to keep track of project progress, measure and evaluate project results. However, the county government can improve their performance, effectiveness, and project success by making their monitoring and evaluation processes stronger. There are several ICT and big data tools that can help. Meetings, work groups, and other parts of community life can be recorded on video and audio by mobile devices, which can be helpful.

Based on the study findings, call for the Machakos county government to deploy ICT-based M&E systems will help in keeping its resources used during road constructions safe. It will also help to track down resources owned by the government hence helping to develop infrastructure. This study, therefore, recommends that ICT-based systems development be promoted and be part of project plan.

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