

African Journal of Education and Practice (AJEP)

**Composite Influence of ICT Infrastructure, School Managers' Efficacy and Attitudes on
Educational Management Information Systems Utilisation in Public Senior Schools in
Nakuru County, Kenya**

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Article History

Received 20th July 2026

Received in Revised Form 28th August 2026

Accepted 26th September 2026



How to cite in APA format:

Kiprono, W. (2026). Composite Influence of ICT Infrastructure, School Managers' Efficacy and Attitudes on Educational Management Information Systems Utilisation in Public Senior Schools in Nakuru County, Kenya. *African Journal of Education and Practice*, 12(4), 46–63. <https://doi.org/10.47604/ajep.3982>

Abstract

Purpose: Educational Management Information Systems (EMIS) are web-based data management platforms essential for assessing the state of education and informing policy decisions. In Kenya, the National Education Management Information System (NEMIS) was launched in 2018 to enhance transparency, accountability and data-driven decision-making in schools. However, effective utilisation of EMIS in public senior schools may be constrained by contextual and user-related factors. The extent to which ICT infrastructure, school managers' efficacy, and attitudes influence utilisation in Nakuru County remained insufficiently established. This study, grounded in Social Cognitive Theory and the Extended Technology Acceptance Model (TAM2), assessed the composite influence of ICT infrastructure, school managers' efficacy, and attitudes on the utilisation of EMIS. A convergent parallel design was employed.

Methodology: A total of 62 principals, 191 deputy principals and 191 class teachers were sampled from public senior schools in Nakuru County, Kenya. The instruments were pretested in five schools outside the study area to assess their clarity, suitability and reliability. Questionnaires and interview schedules were used to collect quantitative and qualitative data, respectively. Quantitative data were analysed using descriptive and inferential statistics, including Pearson correlation and multiple linear regression. Qualitative data were analysed thematically in NVivo following Braun and Clarke's six-phase approach.

Findings: The findings showed that when considered jointly, the three determinants explained 59.0% of the variance in EMIS utilisation, with school managers' efficacy emerging as the strongest predictor, followed by ICT infrastructure and attitude. Qualitative findings corroborated these results, highlighting inadequate training, limited confidence, unreliable electricity, slow internet connectivity, inadequate computers and difficulties in using EMIS. The study concluded that effective utilisation of EMIS in public senior schools in Nakuru County depends on the combined availability of adequate ICT infrastructure, strong school managers' efficacy and positive attitudes towards EMIS.

Unique Contribution to Theory, Practice and Policy: The study recommends an integrated approach involving continuous practical capacity building, adequate and equitable ICT infrastructure, reliable technical support, and improvements in the usability and functionality of EMIS to promote sustained utilisation.

Keywords: Education Management Information System, ICT Infrastructure, School Managers' Efficacy, Attitude, Utilisation, NEMIS, Nakuru County, Kenya

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INTRODUCTION

Education Management Information Systems (EMIS) have become essential tools for enhancing educational planning, monitoring, and decision-making. Governments and educational institutions rely on EMIS to collect, process, and utilise data for policy formulation, resource allocation, and quality improvement in education. As educational institutions increasingly rely on technology to modernise and rationalise administrative processes, the integration of EMIS has become vital. EMIS supports management at different levels in making well-informed strategic decisions. The multidimensional benefits of EMIS include enhanced decision-making, improved efficiency, and resource optimisation within educational settings Adhikari et al. (2024).

In developed nations such as the United Kingdom, Canada, and Singapore, studies have shown that the successful utilisation of EMIS depends heavily on factors such as adequate ICT infrastructure, school managers' efficacy, and positive user attitudes (Wyk & Crouch, 2020). This demonstrates that the availability of digital systems alone does not guarantee effective utilisation; users require the necessary knowledge, confidence and institutional support to integrate such systems into their management practices.

School managers' efficacy is defined as the confidence and competence of school managers in performing EMIS-related tasks, which is a critical factor influencing system utilisation. In addition, the research by Kalankesh et al. (2020) focused on the Factors influencing user satisfaction with information systems. Similarly, attitudes of users may impact their adoption and ongoing use of information systems. Positive attitudes can foster technology acceptance, while negative perceptions of complexity and usefulness can hinder technology utilisation. In addition Effects of school location on principal administrative performance in secondary schools (Oyeleye, 2023). These research implications indicate that user capability and perception, in addition to technology availability, affect the EMIS utilisation. Evidence from African countries indicates that the availability of ICT infrastructure, training and supportive leadership is associated with the utilisation of EMIS. Studies from South Africa, Ghana, Nigeria, and Tanzania show that schools with better ICT infrastructure, regular training, and supportive leadership tend to use EMIS more effectively than those without such conditions Mbema et al (2020). However, in a study by Mbawala et al (2024) on the impact of educational management information systems (EMIS) on school management in Tanzania, challenges such as a shortage of ICT experts, inadequate ICT facilities, and a lack of technical support still pose challenges to the utilisation of EMIS. These findings reinforce the argument that successful EMIS utilisation requires more than the installation of technological systems; it also depends on the capacity of school managers and the environment in which the systems are used.

These challenges can lead to data inaccuracies, delayed reporting, and the inability to use educational data for decision-making. Similarly, a study by Asio et al. (2022) in Tanzania asserts that school managers acknowledge the important functions of EMIS, though faced with difficulties in maintaining proper records that provide primary data for EMIS. Asio et al. (2022) also found that about 40% of school managers could not produce school registers, 41% could not produce fee registers, and a further 60% could not produce registers on staff returns to MOE and other Government bodies. The Basic Education Act (2013) provides that the Cabinet Secretary's responsibility in Kenya is to establish and maintain an integrated and comprehensive Education Management Information System for basic education. This stipulation required the Ministry of Education to set up EMIS as an instrument for gathering

and analysing data on basic education in Kenya (Manja, 2021). This was done in January 2018. Major features of EMIS involve developing a central repository for schools that permits schools to store, access, and handle all education data, such as student enrolments, attendance, personnel and fee collection.

According to Wamutoro et al (2022) Kenyan government implemented a policy on Education management information systems because the manual system is not effective in managing school activities. The manual system is cumbersome when managing student records, thus affecting the management of senior schools. Despite the rollout of EMIS in Kenya and heavy government investment in ICT infrastructure, its utilisation in public senior schools remains limited (Wamutoro et al., 2022). Some schools have reported receiving zero funding due to delays in submitting accurate student data through NEMIS. Despite having workable EMIS in Kenya, users have challenges in its utilisation, and this has a serious impact on the efficacy of the system. Several studies in Kenya have attributed these ongoing problems to factors such as inadequate ICT infrastructure, insufficient training capacity for NEMIS users, and poor internet connectivity (Nyabwari, 2020; Oloo & Were, 2021; Oseko, 2021; Wamutoro et al., 2022). Thus, posing a question of how the utilisation of EMIS is in school management. Therefore, this study established the determinants of utilisation of EMIS in public Senior schools in Nakuru County, Kenya.

The ICT in Education and Training Policy (2021) further emphasised capacity building and the promotion of a positive culture of digital data use in schools (Republic of Kenya, 2021). Despite these policy efforts, empirical studies show wide variation in attitudes among school managers. The need to examine EMIS utilisation is particularly relevant in Nakuru County. Although studies in Kenya have examined NEMIS implementation and ICT integration in different counties, limited empirical evidence exists on the specific determinants of EMIS utilisation among school managers in public senior schools in Nakuru County. Furthermore, in Kenya, the utilisation of Education Management Information Systems (EMIS) remained uneven, with urban schools largely using EMIS for tracking attendance and performance, while rural institutions struggled with outdated technology, poor connectivity, and limited training (Nyabwari, 2020; Oloo & Were, 2021). To address these gaps, continuous managerial training, improved ICT infrastructure, and stronger institutional support were essential (Republic of Kenya, 2021). Studies in Turbo Sub-County, Uasin Gishu County, showed progress in record management and monitoring but highlighted barriers such as weak internet and inadequate funding (Kosgei & Munyua, 2022). However, findings from such contexts could not be generalised to Nakuru County, where limited empirical research existed. A study carried out in Nakuru County by Njeru and Wanjau (2020) shows that many public senior schools are not technologically prepared. ICT training is inadequate and there is a lack of motivation among school managers in the use of ICT. However, most of these studies have concentrated on implementing EMIS or the integration of ICT in general and not specifically on the interrelationships of the school infrastructure, school managers' efficacy and attitudes on EMIS utilisation. Therefore, the present study sought to assess the determinants of school managers' utilisation of EMIS in public senior schools in Nakuru County, Kenya. Specifically, the study examined the influence of ICT infrastructure, school managers' efficacy and school managers' attitudes on EMIS utilisation and determined their composite influence.

Theoretical Framework

Theoretical review gives the background and provides an explanation of the relationships between the variables studied in a research and can give a basis for interpreting the results of the research. Utilisation needs to be understood in relation to the individual and the environment, in the context of Educational Management Information Systems (EMIS). However, the use of EMIS is not limited to the availability of the technology, but also relies on users' skills, confidence, understanding and attitude to use the system and support available to do so. Hence, the present study is based on Social Cognitive Theory (SCT) and the Technology Acceptance Model (TAM); TAM2, which extends the TAM, is used to explain the use of EMIS in public senior schools in Nakuru County, Kenya.

Social Cognitive Theory

Social Cognitive Theory (SCT) was developed by Albert Bandura (1986), which can be used to explain human actions in terms of personal, environmental and behavioural factors. Self-efficacy is a key tenet of the theory. It is the idea that someone has in terms of having the ability to organise and carry out the action(s) that are needed to create a particular outcome. The theory of social Cognition is applicable in the context of school administrators' efficacy. To make the best use of EMIS, school leaders need to be confident and competent using the system to enter, retrieve, verify and interpret data, and to produce reports. A competent school administrator will be more likely to interact with the system in a way that will result in a solution to technical issues. The theory is thus used as the main theoretical framework to explore the connection between school managers' efficacy and the use of EMIS. Social Cognitive Theory recognizes the importance of the environment in shaping behaviour. The environmental dimension is particularly reflected in ICT infrastructure, including computers, software, internet connectivity, and electricity. Even when a school manager has high efficacy, inadequate infrastructure may restrict opportunities to use EMIS effectively. Conversely, adequate infrastructure can provide an enabling environment in which users can apply their skills and confidence. SCT is therefore beneficial in explaining why individual capability and environmental conditions should be considered together when examining EMIS utilisation. However, SCT provides a broad explanation of the reciprocal relationship between individual capability, behaviour and environmental conditions; its broad scope does not specifically explain the technology-acceptance mechanisms through which users form attitudes toward an information system.

Technology Acceptance Model (TAM 2)

In 1989, Fred D. Davis created the technology acceptance model (TAM2) to explain the acceptance and use of information technologies. The model states that two beliefs are related to the acceptance of technology: perceived usefulness (PU) is the degree to which a user believes that using a particular system will be useful in their work and perceived ease of use (PEOU) is the degree to which a user believes that the use of a particular system will be easy. These beliefs shape the attitude of the users toward information technology and hence their behavioral intention and actual system use, as suggested by Davis (1989). TAM provided an important foundation to explain the acceptance or rejection of information systems, has been widely applied in organisational and educational technology research, and is a basic model in this field today. The original TAM has been shown to be extremely useful in explaining the perceived usefulness, but has come under criticism for providing a relatively narrow range of explanations of factors that impact perceived usefulness and users' intentions to use technology.

The model, in particular, neglected to take into consideration the social/cognitive dynamics whereby users develop perceptions of the usefulness of a technological system. These constraints were identified by Venkatesh and Davis (2000) and an extension of the original TAM, called TAM2, was created. TAM2 added some of the social influence processes, as well as some cognitive instrumental processes, to expand the explanation of technology acceptance and kept the main concept of perceived usefulness affecting the intention to use technology.

TAM2 is relevant to the current study because, beyond the technology being available in public senior schools, it is how school managers perceive and react to the technology in their work environment. School managers are more likely to value and use EMIS if they think it is relevant to their work, is useful and reliable, is able to report and make decisions and is easy to operate. Similarly, managers in the school or education system may have opinions on the use of EMIS within the school and education system. Similarly, expectations of the school and education system might also influence school managers' expectations of EMIS. All these factors can affect their acceptance of the system and involvement in regular school practices of school management. The theory thus provides a basis to explain the user acceptance part of the use of EMIS. The theory is also related to the focus of the study, which is the attitudes of the school managers towards EMIS.

The combination of Social Cognitive Theory and TAM2 enables the study of the EMIS utilisation from a user-capability and environmental perspective and a technology-acceptance perspective. Therefore, the present study is enriched with TAM2, which explains the theoretical aspects of how school managers' perceptions and attitudes towards EMIS can impact their use of the system. However, based on the tenets of Social Cognitive theory, the theory is also used to explain the other factors that affect the utilisation of EMIS in public senior schools in Nakuru County, Kenya.

LITERATURE REVIEW

This section reviews empirical studies on the utilisation of Education Management Information Systems (EMIS) and the factors that influence their effective use in educational institutions. The review draws on evidence from global, regional and Kenyan contexts, with particular attention to studies examining ICT infrastructure, school managers' efficacy, school managers' attitudes and the utilisation of EMIS. The empirical review is organised according to the four study objectives: the influence of ICT infrastructure on EMIS utilisation, the influence of school managers' efficacy on EMIS utilisation, the influence of school managers' attitudes on EMIS utilisation, and the composite influence of ICT infrastructure, school managers' efficacy and attitudes on EMIS utilisation.

ICT Infrastructure and Utilisation of EMIS

According to Sigdel (2022), based on UNESCO Institute for Statistics' EMIS typology data, an average of 80% of countries had developed their own EMIS software, while others relied on platforms such as StatEduc, OpenEMIS and spreadsheet-based solutions such as Excel. Globally, adequate computers, software, electricity, connectivity, system compatibility and technical support facilitate EMIS utilisation. Research shows that weak ICT infrastructure and limited user support significantly restrict EMIS functionality, highlighting the need for continuous and sustained investment in digital systems (Wyk & Crouch, 2020). Most schools have low investment in ICT infrastructure due to high costs of computer hardware, software and related accessories (Bariu, 2020). Moreover, a study by Tulowitzki et al (2022) in Germany found that school principals in Germany use ICT to manage school activities. However, they

face significant barriers, such as a lack of competencies and support. The study used a mixed-methods approach, combining quantitative and qualitative data from interviews with German principals. The study also identified four clusters of principals with different patterns of ICT usage: low users, high users, communicators, and representatives.

In Africa, the adoption of EMIS has been promoted to support the achievement of Sustainable Development Goal 4, which focuses on ensuring inclusive and equitable quality education. However, the continent faces numerous challenges without specifically identifying how each factor hampers the optimal utilisation of EMIS by school managers and policymakers (African Union, 2021). These challenges often lead to underutilization of data systems and missed opportunities for enhancing educational outcomes. African schools experience more severe infrastructural constraints, including unreliable electricity, poor internet connectivity, inadequate hardware, limited technical support and inadequate funding, in Rwanda, Tanzania, Nigeria and Ghana. Research conducted by Mbeba and Ngowi (2020) and Osei-Adjei (2021) indicates that although ICT infrastructure is contributing to the utilisation of EMIS, human capacity and system management remain a challenge to the effectiveness of EMIS. However, one of the main challenges associated with the use of EMIS remains weak internet connectivity, as highlighted by Harerimana (2020) in Rwanda. Mwenda and Mwasandube (2024) were interested in evaluating the performance of the Primary School Records Management System (PReM) in Primary Schools in Tanzania. The design used was quantitative. PReM is a localized Education Management Information System (EMIS) to enhance data collection, monitoring and reporting activities in public schools. The study demonstrated that Information systems (like PReM) are effective tools for improving school data management, transparency and accountability. Availability of Infrastructure (e.g., power, internet), User ICT competence and Training and technical support are key to the effectiveness of such systems. School managers recognize the importance and value of digital systems, particularly in school administration, such as attendance records and reporting.

School Managers' Efficacy and Utilisation of EMIS

School managers' efficacy refers to their confidence, competence and perceived capability to perform tasks effectively using EMIS (Bandura, 1986). Effective utilisation of EMIS requires school managers not only to have access to the system but also to possess the knowledge, skills and confidence necessary to use it for routine administration, data management, reporting and decision-making. A study by Röhl et al. (2024) found that school leaders' self-efficacy has been found to be related to the successful development of schools and indirectly related to student learning. The study revealed that neither school leaders' leadership experience nor school size significantly influenced the use of EMIS, and further found that the school leaders' self-efficacy significantly influenced the width and depth of the innovations introduced in the schools during the crisis, even though it was proposed that EMIS can contribute to the improvement of institutional effectiveness. Mutuku (2022) observed that many African countries, including

Kenya, face major challenges in EMIS utilisation due to insufficient training and a lack of technical support, which hampers data entry, report generation, and troubleshooting. The study emphasised the importance of ongoing support and professional development to enhance user competence. This aligns with findings from the current research, where 50% of respondents reported receiving support from technicians when encountering EMIS-related challenges.

Similarly, Wamutoro et al. (2022) noted that the Government of Kenya implemented policies to transition from manual to digital student record systems through EMIS to improve school

management. Using a pragmatic paradigm and mixed-methods design, their study found a significant relationship between EMIS use for student data and school management efficacy. They revealed that EMIS improves communication of student progress and instructional strategies between school management and teachers. This coordination was linked to better student outcomes. However, the success of EMIS relies heavily on continuous user training and support.

School Managers' Attitudes and Utilisation of EMIS

Khanal and Joshi (2021) synthesised findings from multiple countries. It reflected a broader pattern of EMIS utilisation increasing when teachers' attitudes were positive. Studies across the globe have proven that positive attitudes towards EMIS and digital platforms play a crucial role in the adoption and utilization of the system. Davis et al. (1989) established that perceived usefulness and ease of use are fundamental determinants of users' acceptance and usage behaviour of technology. In education, teachers' positive attitudes towards EMIS and perceived ease of use have emerged as consistent predictors of the degree to which teachers actually participate in the collection, management, and utilisation of data for data-driven policy-making in schools. Kabra et al. (2023) carried out a study on Factors influencing adoption of cloud computing services in HEIs: A UTAUT approach based on students' perception. This study concerns cloud computing, higher education institutions, and students, not principals' EMIS use. Also it did not explore in depth principals' attitudes towards the use of EMIS in their routine management tasks, and this was identified as a gap in the understanding. Sellami and Mahfouz (2024) carried out a study on Demystifying educational leadership and administration in the Middle East and North Africa and found out that the perceived usefulness, ease of use and the subjective norm have a significant influence on principals' attitudes toward EMIS. The study used a quantitative research design, whereas the current study employed a convergent parallel design.

METHODOLOGY

Research Design

The research model applied was convergent parallel (mixed methods research) because, according to Creswell and Creswell (2023), the research model was chosen based on the need for a comprehensive understanding of the problem of the study. Design used for triangulation. Creswell and Clark (2017) have used triangulation to compare results from different data sources, to validate or invalidate results. The quantitative data were analysed with descriptive (frequency, percentage, mean, standard deviation) and inferential statistics (Pearson correlation and multiple linear regression). The qualitative data were analysed thematically following the steps set by Braun and Clarke (2006). The two findings were then combined and correlated for similarities, dissonances and complementarities.

Location

The research study was carried out in Nakuru County, Kenya. Nakuru metropolitan area had an estimated population of 422,000 in 2023, representing a 3.43% increase from 2022.

Population

The accessible population comprised 384 public senior schools in Nakuru County, Kenya. The study targeted the County Director of Education (1), 11 Sub-County Directors of Education,

384 principals, 394 deputy principals, and 768 class teachers, giving a total accessible population of 1,558 individuals.

Sampling Procedure and Sample Size

Respondents for the study were sampled from five categories: the County Director of Education, Sub-County Directors of Education, principals, deputy principals and class teachers. The initial sample sizes were calculated using Nassiuma's (2000) formula:

$$n = \frac{NC^2}{C^2 + (N-1)e^2} \dots\dots\dots 1$$

For principals (N = 384): n = 142; For deputy principals (N = 394): n = 144; For class teachers (N = 768): n = 174.

To ensure that the data collection was of high quality, a number of practical matters had to be addressed in the design of the study. Anticipated nonresponse rate is 25 per cent; the number of deputy principals and class teachers was increased by 25 per cent to 191 each. To collect quality data, the final sample sizes were guided by several practical constraints. The target number of principals obtained from the Nassiuma (2000) formula was 142, but it was not possible to reach all 142 during the period of data collection. As a result, 62 principals formed the final sample. The 11 Sub-County Directors of Education and the County Director of Education were also purposively selected.

Instrumentation

In this study, questionnaires and interviews were used as the primary data collection instruments to assess the determinants of EMIS utilisation among school managers in public senior schools in Nakuru County. To assess the research objectives, three questionnaires were administered to class teachers, deputy principals, and principals, and three interview schedules were used for CDE, SCDE, and principals.

Validity and Reliability

The content, construct and face validity of the research instruments were checked to ensure the accuracy of the instruments. The content validity established the relevance of the items that were employed in the questionnaires and interviews to the purpose of the study. The reliability of the questionnaire was assessed using Cronbach's alpha, calculated from data collected in the pilot study. The correlation coefficients for ICT infrastructure, managers' efficacy, and managers' attitudes had Cronbach's alpha values of 0.877, 0.856, and 0.844, respectively, and were thus considered reliable for the study.

Data Collection Procedure

Ethical approval was initially obtained from Kabarak University Research Ethics Committee (KUREC). Using the clearance letter, an application was made for a research permit from the National Council of Science, Technology and Innovation (NACOSTI). After obtaining the permit, the researcher obtained an introductory letter from the Nakuru County Director of Education and formally requested permission to carry out the study in the public senior schools in the county. All participants received consent forms before data was collected to give them full information and to ensure that they consented to participate in the study.

Data Analysis

Descriptive and inferential statistics were applied. The data was tabulated using descriptive statistics in terms of frequency and percentage. Conversely, the data was analysed using inferential statistics (Pearson correlation and multiple regression analysis) to determine the relationship. Multiple linear regression analysis was performed to check whether a significant linear correlation between the dependent and independent variables exists. Qualitative data, which was collected from interviews, was analysed thematically and presented through narratives and tabular summaries.

RESULTS

Demographic Characteristics of the Participants

The study collected demographic information from class-teacher respondents, including age, gender, teaching experience, and school category. The majority of class teachers (49.7 percent) fell within the 25–34-year age bracket, followed by 40.1 percent in the 35–44-year age bracket. Male teachers constituted 61.1% of the sample, while female teachers accounted for 38.9%. Class teachers had varied teaching experience, with 43.9 percent having between one and five years of experience and 29.9 percent having six to ten years.

Male deputy principals comprised 51.3% of the sample, while female deputy principals accounted for 48.7%. The majority of deputy principals (69.7%) were aged 45–54 years. The majority of deputy principals (49.3%) had more than 15 years of teaching experience.

Male principals constituted 56.5% of the sample, while female principals accounted for 43.5%. The majority of principals (58.1%) were aged 45–54 years. The vast majority of principals (85.5%) had more than 15 years of teaching experience.

Descriptive Statistics

ICT Infrastructure

Class teachers' responses on ICT infrastructure and its role in EMIS utilisation showed that the statement "Digital records are accessible and more durable than manual records" had the highest mean of 4.08 (SD = 0.79), with 80.2% of respondents agreeing or strongly agreeing. The statement "The school has no stable electricity for EMIS utilisation" recorded a mean of 2.54 (SD = 1.09), indicating that while electricity instability was a concern, it was not universal. The statement "EMIS is installed in the principal's computer only, not all computers" had a mean of 2.74 (SD = 1.19), suggesting that access to EMIS was often restricted to the principal's computer rather than being available on all computers.

Deputy principals' perceptions of ICT infrastructure showed that the statement "ICT infrastructure supports secure storage and preservation of EMIS data" recorded the highest mean of 4.16 (SD = 0.78), with 81.5% agreement. "Electricity is sufficiently reliable for continuous EMIS use" received a mean of 3.96 (SD = 0.91), with 73.0% agreement. "Stable internet connectivity makes it easier for EMIS utilisation," recorded a mean of 3.51 (SD = 1.12), suggesting that internet reliability remained a challenge in many schools.

Principals' ratings showed that the statement "Computer hardware helps prevent loss of school records" had the highest mean of 4.24 (SD = 0.80), with 80.6% agreement. The statement "The school allocates funds to upgrade ICT facilities for EMIS" received a low mean of 2.81 (SD = 1.17), with only 33.8% agreement.

School Managers' Efficacy

Deputy principals responded to six statements regarding their ability to use EMIS. Mean scores ranged from 2.64 to 3.30, all below the midpoint of 3.5 on the 1-5 scale. The item 'It is easy to enter correct data into the EMIS and to retrieve it' had the highest mean score (3.30), but fewer than half of the participants (43.5%) indicated agreement. The training indicators were the lowest, with only 22.4% having participated in EMIS training in the previous year (2.64) and a mere 20.4% believing they were adequately trained (2.66).

School Managers' Attitudes

Deputy principals' attitudes towards EMIS showed that 73.7% agreed that "I believe all school managers should use EMIS" (mean 3.95). "EMIS is good for producing student academic reports" had a mean of 3.84 (65.1% agreement). "EMIS is good for keeping students' discipline records" had a mean of 3.80 (65.8% agreement). "I am willing to use EMIS regularly in my duties" had a mean of 3.77 (59.8% agreement). The statement "EMIS is user-friendly" had a mean of 3.16 (38.8% agreement). "I find little value in using EMIS for school management" had a mean of 2.90.

Inferential Statistics

Multiple Regression Analysis

A multiple linear regression was performed with all three independent variables entered simultaneously. The regression equation was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon \dots\dots\dots 2$$

Where Y = Effective EMIS Utilisation, X_1 = ICT Infrastructure, X_2 = School Managers' Efficacy, X_3 = School Managers' Attitudes, β_0 = constant, β_1 , β_2 , β_3 = partial regression coefficients, ε = error term. Table 3 presents the regression results.

Table 3: Composite Influence of ICT, Efficacy, and Attitudes on EMIS Use

Table 1: Composite Influence of ICT Infrastructure, Efficacy, and Attitudes on Effective EMIS Utilisation in Public Secondary Schools (N = 152)

Predictor	B	SE	β	T	P	95% CI for B	VIF
(Constant)	-3.660	0.522	—	-7.015	< .001	[-4.691, -2.629]	—
ICT Infrastructure	0.930	0.141	.392	6.600	< .001	[0.651, 1.208]	1.272
Efficacy	0.907	0.113	.463	8.045	< .001	[0.684, 1.129]	1.194
Attitude	0.298	0.130	.142	2.300	.023	[0.042, 0.555]	1.370

Model Summary. $R = 0.768$, Adjusted $R^2 = 0.582$, Std. Error of Estimate = 0.446, $F(3, 148) = 71.089$, $p < .001$.

Note. Predictors: ICT Infrastructure, Efficacy, and Attitude. Dependent Variable: Effective EMIS Utilisation. B = Unstandardised coefficient; β = Standardised coefficient; VIF = Variance Inflation Factor.

The multiple regression model was statistically significant, $F(3, 148) = 71.089$, $p < 0.05$. The R^2 value of 0.590 indicated that the three independent variables together accounted for 59.0 per cent of the variance in effective EMIS utilisation. The adjusted R^2 of 0.582 suggested that the model would continue to explain approximately 58.2 per cent of the variance in the population, representing a strong model fit.

Estimated regression equation: $Y = -3.660 + 0.930(X_1) + 0.907(X_2) + 0.298(X_3)$

The unstandardised coefficients indicated the unique contribution of each independent variable, holding the others constant. For each one-unit increase in ICT infrastructure (X_1), EMIS utilisation increased by 0.930 units, holding efficacy and attitude constant. For each one-unit increase in efficacy (X_2), EMIS utilisation increased by 0.907 units, holding ICT infrastructure and attitude constant. For each one-unit increase in attitude (X_3), EMIS utilisation increased by 0.298 units, holding ICT infrastructure and efficacy constant.

The standardised beta coefficients allowed comparison of the relative strength of each predictor. Efficacy had the strongest unique contribution ($\beta = 0.463$, $p < 0.05$), followed by ICT infrastructure ($\beta = 0.392$, $p < 0.05$), with attitude making a smaller but still significant contribution ($\beta = 0.142$, $p = 0.023$).

The variance inflation factor (VIF) values ranged from 1.194 to 1.370, which are much lower than the commonly accepted cutoff of 5.0, indicating that multicollinearity was not a problem.

Cohen's f^2 for the multiple regression model was calculated as $f^2 = R^2 / (1 - R^2) = 0.590 / (1 - 0.590) = 0.590 / 0.410 = 1.439$. An f^2 of 1.439 is a very large effect size compared to the effect sizes of the simple regression models in isolation, according to Cohen's (1988) conventions.

Qualitative Findings: Institutional Support Mechanisms and Integration

The qualitative analysis for Objective 4 focused on institutional support mechanisms, as these represented the practical manifestation of how infrastructure, efficacy and attitude combined in real schools. The analysis revealed three sub-themes: availability of technical support, helpdesk responsiveness, and school-level ICT personnel. Additionally, negative cases were analysed to understand how some schools succeeded despite systemic constraints.

Sub-theme: Technical Support Availability

Interviewees reported that technical support was inadequate, with too few ICT officers serving too many schools. The County Director of Education stated that:

"We do have a technical support team at the county level that deals with the more complex issues. At the sub-county level, there is also an ICT officer who is supposed to support schools. But the situation is that we currently have 11 sub-counties and only 7 ICT officers. Certain sub-districts are covered by one officer, which means response times are long when schools report issues." (CDE-01)

These findings are consistent with those of a study by Walela et al. (2024), which found that integration, automation, information access, usability, efficiency, cost, scalability, accountability, security, robustness, technological support, and storage capacity are critical factors influencing information system implementation in Kenyan institutions.

A principal from a county school described the consequences of inadequate support:

"There is no ICT teacher assigned to us. The computer studies teacher left two years ago and has not been replaced. So when our EMIS system breaks down, we have no one at the school to fix it. We have to phone the office at the sub-county level and wait, sometimes for weeks, for a response." (P-SB-07)

Helpdesk Responsiveness

Interviewees reported mixed experiences with the NEMIS helpdesk. A principal from a national school described positive experiences:

"When I first started learning EMIS, I called the helpdesk almost every day. They were patient and helpful. They walked me through the steps and, if they could not solve the problem, escalated it to the technical team. Over time, I needed them less frequently, but knowing they were there gave me confidence." (P-NE-05).

A principal from a sub-county school described negative experiences:

"I have called the helpdesk at least ten times. Most of the time, no one answers. When someone answers, they put me on hold for 20 minutes, then transfer me to someone else who asks me to explain the problem again. I have never had a problem resolved on the first call. Usually, I give up and try to find a workaround myself." (P-KS-04)

School-Level ICT Personnel

Interviewees consistently noted that schools with ICT-qualified teachers on staff had better EMIS outcomes. A deputy principal from a well-resourced extra-county school described their arrangement:

"We have an ICT teacher who not only teaches computer studies but also serves as our in-house EMIS champion. Whenever a problem arises, he is the first person that they turn to. If he is unable to resolve it, he contacts the sub-county ICT officer. This system is successful because most issues are resolved at school within a few hours." (DP-NN-09)

"Yes, we have a difference," a Sub-County Director remarked.

The lack of an ICT teacher in schools is a huge disadvantage; not only do they have somebody who can teach computer studies, but they also have somebody who can maintain the computers, troubleshoot the network, and support the users of EMIS, which is already a lot for the sub-county ICT officer to handle. (SCDE-NW-08)

Negative Case Analysis

Through negative case analysis, schools were identified that had managed to break the dominant pattern of low efficacy and mixed attitudes regarding infrastructure.

Negative Case 1 - P-NE-05 (Principal, National School): This was a principal's school that had purchased fibre internet, 20 computers of which 20 were working, had solar backup power and employed an in-house ICT teacher. The principal himself had discovered EMIS by watching YouTube tutorials and getting help from the helpdesk. His school never had late assignments, and his data was among the most accurate in the county. This case illustrated the possibility of achieving effective EMIS utilisation with proper investments and individual initiative.

Negative Case 2 - P-RG-06 (Principal, Extra-County School, Rongai): This principal described his attitude towards EMIS, from hate to appreciation. His change has been attributed to his continued use and a supportive colleague. This case illustrated that attitudes were malleable and that negative firsthand experiences did not have a lasting impact on utilisation outcomes.

These negative cases are important because they show that the barriers to effective EMIS utilisation, while significant, are not insurmountable. They provide evidence for what works (investment in infrastructure, in-house technical support, self-directed learning, persistent use) and can inform recommendations for policy and practice.

Discussion

The findings of this study provide compelling evidence that the composite influence of ICT infrastructure, school managers' efficacy, and school managers' attitudes significantly predicts effective EMIS utilisation in public senior schools in Nakuru County, Kenya.

This finding indicates that school managers' efficacy is the most critical determinant of EMIS utilisation, followed by ICT infrastructure, and then attitudes.

The composite influence ($R^2 = 0.590$) was significantly larger than individual influences of the determinants, that is, the influence of ICT infrastructure alone (34.4 per cent), efficacy alone (39.5 per cent) and attitude alone (24.3 per cent). It is therefore assumed that the three determinants are complementary; without the presence of any one determinant, optimum EMIS use cannot be achieved. The proper infrastructure, confident and competent managers, and positive attitudes are required for the effective utilisation of EMIS.

Aapun (2024) found that teachers' self-efficacy beliefs significantly influence ICT integration in secondary school teaching, with self-efficacy explaining a substantial portion of the variance in technology adoption behaviours, confirming the importance of self-efficacy as a key determinant of technology utilisation in educational settings. The R^2 value of 0.590 represented a substantial improvement over each simple regression model individually, indicating that the three determinants complemented each other.

Ariko (2024) examined personnel factors influencing EMIS outcomes in Kenya's Nyanza Region and found that job design ($\beta = 0.317$), gender ($\beta = 0.291$), and age ($\beta = 0.223$) were significant predictors, contributing 16.9% to EMIS outcomes. This reinforces the present study's finding that multiple determinants, including personnel-related factors, collectively influence EMIS utilisation.

The qualitative results confirmed these findings. The negative cases (P-NE-05, P-RG-06's unnamed principal) showed that the three factors were aligned in successful schools in terms of EMIS utilisation: infrastructure, efficacy and attitude. Conversely, the qualitative data indicated that none of the factors alone was enough. Schools with good infrastructure but low efficacy (such as P-NV-03, which relied on the deputy principal's presence) experienced difficulties when the knowledgeable person was absent. P-KS-04: Positive attitudes but poor infrastructure; frustrated "compliance" schools. The meeting confirmed that infrastructure, efficacy, and attitude are interrelated factors, and that good EMIS utilisation depends on considering all three.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the findings, the study drew the following conclusions in line with its objectives. The three determinants together had a significant composite influence on utilisation of EMIS in public senior secondary schools in Nakuru County, Kenya. Efficacy was the strongest unique contributor, followed by ICT infrastructure and attitude. Though small, it was significant, thus indicating that, without considering other determinants, intervention will have only minimal success.

ICT infrastructure was a major factor that influenced public senior secondary schools in Nakuru County to use the EMIS effectively. There was evidence of more effective use of EMIS in schools with greater numbers of computers, good internet access, and stable electricity

supplies. However, the distribution of infrastructure was not even. The schools were generally better resourced at national and extra-county schools compared to sub-county schools, especially those in remote areas like Kuresoi and Subukia.

School managers' effectiveness was most predictive. Managers who were confident, well-trained, and able to troubleshoot simple problems independently were more likely to use EMIS effectively. The quality of the training provision, however, was not up to standard. The majority of managers had only undergone one day of initial training at the time of NEMIS's launch in 2018, and there had been no systematic refresher training since then.

The attitudes of the school management had a moderate positive influence on the use of EMIS. The majority of managers had positive attitudes towards EMIS and felt that all school managers should use it. But positive attitudes alone weren't enough to drive effective use with infrastructure deficits and low efficacy.

Recommendations

Policy Recommendations

First, the Ministry of Education should, together with the Ministry of Information, Communication and Technology, increase ICT infrastructure in public secondary schools. The schools that require special attention are those in sub-county schools and remote areas such as Kuresoi North, South and Subukia, which are under-resourced.

Second, the Ministry of Education should create a long-term programme of continuous professional development for school managers in the use of EMIS. The programme should be more than just the one-day training model, which has proven to be too short. It should comprise regular refresher courses, mentorship within schools (confident users with less confident colleagues), hands-on practice sessions, and the development of local EMIS champions in each school at least twice a year.

Third, the government ought to invest more to make the EMIS platform easier to use. Specific enhancements would include ease of use in user interface design, to minimise the number of clicks needed to perform routine functions; in-system tutorials and help features that explain each function step by step; functionality that allows for upload of videos or other multimedia content for student records, and functionality that allows for regular data updates without technical difficulty.

Fourth, the Ministry should address the technical support challenge by appointing at least one dedicated ICT officer in every sub-county to assist with EMIS support. Seven ICT officers are currently operating in eleven sub-counties, which is not enough, confirmed by the county director. The Ministry should also consider and facilitate the use of ICT-trained teachers in the schools as first-line support in handling EMIS problems. Additionally, the Ministry should develop a feedback mechanism to help complete the circle of data submission and use.

Recommendations for Further Research

Future research should explore the link between the use of EMIS and student learning outcomes, since this study was limited to examining the determinants of EMIS use and not the effect of use on educational quality. Secondly, an evaluation of EMIS use over time should be conducted, as infrastructure develops and training programmes are started. A cross-sectional design was used in this study, and this can only be used to make associations. Hence, a longitudinal study that tracks the same schools over two or three years and measures EMIS use

before and after interventions (infrastructure investment, training programmes, usability) will give clearer causal relationships and determine the effectiveness of interventions at different stages of EMIS use and finally the third is a comparative studies across counties in Kenya would help determine whether the factors identified in Nakuru County are also applicable to other counties with different infrastructure, training programs, and socio-economic conditions.

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