



Appraisal of Education Management Information Systems for Information Management by Secondary Schools in Mezam Division, North West Cameroon

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Abstract: This study investigated the level of availability and use of Education Management Information Systems EMIS in information management among secondary schools in Mezam Division, North West Cameroon. Guided by Systems Theory, the Technology Acceptance Model, and Diffusion of Innovation Theory, this study employed a mixed methods QUAN (qual) nested explanatory design. A stratified sample of 79 secondary schools in Mezam Division (public, lay private, and confessional) was surveyed using structured questionnaires (Cronbach's $\alpha = 0.933$), complemented by semi structured interviews. Quantitative data were analysed using descriptive statistics and ANOVA, while qualitative narratives contextualised findings. The findings revealed a pivotal paradox: ANOVA revealed no significant differences in EMIS availability across school types ($F(2,110) = 1.27, p > 0.05$), with lay private schools recording the highest use rating ($M=4.0, SD=2.5$); while utilisation varied significantly across school strata ($F(2,110) = 5.13, p < 0.01$), with lay private schools demonstrating comparatively higher levels of adoption. Furthermore, only 42.5% of schools reported adequate EMIS hardware, and 37.2% had specialised software beyond generic Microsoft packages. Utilisation was lower, with 31.8% of administrators consistently applying EMIS for core tasks such as admissions, assessment records and report card production, and staff management. Qualitative findings highlighted infrastructural deficits, limited training, and weak institutional support as persistent barriers. The study confirmed the persistence of the “design-reality gap” in EMIS implementation in Mezam Division. By establishing an empirical baseline, it provides critical evidence to guide national EMIS development tailored to the practical realities of Cameroonian schools. The study therefore recommended that developers should create EMIS software that prioritise offline functionality and localised customisation to reflect user reality. Policy Makers must fund infrastructural investment (hardware/specialised software). Ministry/Regional Officials should decentralise and fund continuous, practical training for capacity building of administrators. Finally, school administrators must enforce mandatory utilisation protocols for core administrative tasks to close the design-reality gap.

Keywords: Education Management Information Systems (EMIS); Information Management; School Administration; Availability, Use, Technology Adoption; Systems Theory, Mezam Division;



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Introduction

School administration is largely dependent on effective information management to support decision-making, making EMIS indispensable. Despite the growing global recognition of EMIS as a vital tool for educational effectiveness, its application in many developing contexts remains uneven (Abdul-Hamid et al., 2015). Functionally, EMIS is an internationally recognised acronym for a comprehensive, computer-based information system designed to manage educational data from the school level through to national and international levels (Cuartero & Role, 2018; Husein, 2014; Nganjiozor, 2016; Villanueva, 2003). It is conceptualised as a specialised management information system that supports both school-level and sector-wide educational management (NESIS/UNESCO Wako, 2003). Analytically, EMIS represents more than a mere technological tool; it is an institutionalised framework whose primary mandate is to operate a set of processes that transform educational data into actionable intelligence.

UNESCO (2018) and Luena (2012) frame EMIS as the system responsible for the full data lifecycle: to collect, aggregate, analyse, disseminate, and utilise educational data for critical management functions such as planning, monitoring, and policy formulation. This comprehensive nature necessitates the integration of people, practices, and technology to provide quality information in a timely, cost-effective, and sustainable manner (Bernbaum, 2011). The importance of EMIS stems from its dual mandate: at the macro-level it is a nationwide system that supports sector-wide educational services such as planning, policy formulation, monitoring, and evaluation (Cuartero & Role, 2018). Simultaneously, at the micro-level, it is vital for the fulfilment of fundamental managerial functions, including personnel, student, finance, and material resource management in schools essentially supporting school operations. This functional dependency underscores a critical analytical extension: information is not just a resource but a strategic asset (Aldarbesti & Saxena, 2014). Its proper management, therefore, is a prerequisite for effective accountability, transparency, and evidence-based decision-making at every tier of the education system. The efficacy of this digitised process, however, hinges on infrastructural stability, organisational culture readiness, and sustained practices that ensure data quality.

As UNESCO (2018) acknowledges, EMIS's effectiveness is often constrained by inadequate infrastructure and data quality which are variables often strained in resource-limited contexts. Research consistently shows that EMIS adoption in low-resource settings is constrained by inadequate infrastructure, poor training, or weak institutional frameworks, leading to the "design–reality gap" (Heeks, 2002), where the mere availability of EMIS tools does not automatically translate into their effective use (Mugo et al., 2017). Luena (2012) suggests that EMIS's adoption varies with institutional capacity or resistance, implying that its effectiveness is a product of technological readiness, institutional commitment, and information management priorities. The evolution of EMIS from a simple data repository to a complex analytical platform thus reflects a broader shift in educational philosophy: from managing schools by anecdote or tradition to leading them through empirical insight. Despite EMIS being globally recognised for enhancing educational management, its application in Mezam Division, North West Region, appears limited and uneven. This local reality, which stands in contrast to the system's global recognition, necessitates the current study to explore the extent of its adoption. The present study, therefore, seeks to appraise the adoption of EMIS in secondary school administration in Mezam Division by examining the level of availability of EMIS infrastructure and evaluating the extent of its utilisation by school administrators.

Contextual underpinnings

Information is known to be amongst the most vital resources needed for smart decision-making, problem-solving, and organisational performance, affording a competitive advantage to those institutions which effectively manage it (Opoku, 2015; Zaman et al., 2019). Due to the high potential of information as a resource, the success of every organisation is contingent on its effective management, making Information Management (IM) an important area of research

interest for some decades now (Bessick, 2016; Detlor, 2010; Opoku, 2015). The concept of automated information management is much older than modern systems like EMIS, dating back as far as the 1800s when Joseph Marie Charles Jacquard introduced punch cards in 1801 for capturing, processing, and printing information (Weedmark, 2019). The academic adoption of computer-based MIS followed later, notably starting at Minnesota University in 1965, and was adopted by many academic centres as a modern scientific attitude (Weedmark, 2019).

The push for modern IM as an organisational resource gained momentum in the late 1970s with the US Paper Reduction Act, which aimed to reduce the cost of managing and handling paper-based information. During this period, the term Information Resources Management (IRM) emerged, coined by Forest W. Horton, Jr., to signify the management of both information and the associated information technologies (Horton 1979, 1982, as cited in Detlor, 2010a). Concurrently, the development of school administrative computer applications started, and by the 80s, a number of clerical and administrative applications had been developed (Shah, 2014). The initial purpose of these MIS tools was to support management functions by providing descriptive and diagnostic information (Reza et al., 2013; Harsh, n.d.), mainly focusing on improving clerical activities by capturing, storing, and retrieving data, with complex data analysis remaining minimal (Shah, 2014). This evolution confirms that the development of information management is intrinsically linked to continuous computer inventions and technological advancement.

Over the past three decades, these advances in digital technology have fundamentally reshaped how educational systems manage information, positioning Education Management Information Systems (EMIS) as indispensable for evidence-based decision-making, accountability, and planning. EMIS is recognised as a specialised system with a dual mandate: at the macro-level, it is a nationwide system supporting sector-wide services like planning and policy formulation, but simultaneously, at the micro-level, it is vital for the fulfilment of fundamental school managerial functions, including personnel, student, finance, and material resource management. However, research consistently shows that EMIS adoption is uneven globally, often constrained by inadequate infrastructure, policy dysregulations¹, poor training, or weak institutional frameworks (Adhikari & Budhathoki 2025; UNESCO, 2020). This lack of seamless translation from system availability to effective use is a phenomenon Heeks (2002) conceptualises as the "design–reality gap." This challenge is widely observed in sub-Saharan Africa, where EMIS adoption, promoted by national and international initiatives often lags at the school level. The situation in this subcontinent provides compelling empirical evidence of this global trend. In Kenya, a study by Mutisya and Mwanja (2017) revealed that despite targeting schools with functional ICT infrastructure, integration into school management remained limited, with only 59% to 78% of administrative staff using technology for management tasks. This indicates that even in equipped schools, penetration is far from complete, highlighting the challenge of moving from basic availability to consistent use. Another Kenyan study by Beignon (2017) found that although the schools possessed EMIS infrastructure, usage was low due to lack of training and insufficient connectivity- a trend echoed in Ghana where manual record-keeping persisted because staff lacked confidence in the systems (Ampofo, 2020).

This global reality is acutely felt in Cameroon. The evolution of ICT and Education Management Information Systems (EMIS) in Cameroon presents a clear tension between national ambition and systemic implementation challenges. The policy foundation was laid in the early 2000s, initiated by presidential declarations that incentivised computer imports and later consolidated by a Ministry of Education (MINEDUC) and World Bank partnership, culminating in a formal ministerial decree by 2005 (Tetang, 2007; Zhejiang & Ngo, 2016). Despite this top-down push, the actual integration of technology has been uneven and largely ineffective. As Tetang (2007) observed, early progress was confined mainly to universities and technological secondary schools,

¹ " Policy dysregulation " refers to a failure in the systems and processes that translate policy goals into actionable rules and outcomes

while government secondary schools remained impoverished, reliant on foreign donations for hardware, and unable to sustain ICT-related activities.

This initial disparity foreshadowed a persistent underperformance in ICT utilisation across Cameroon. A decade later, Haji et al. (2017) confirmed that national ICT integration remained “less than optimal,” a finding echoed in administrative contexts by Ahmed et al. (2020), Karşı & Şahin (2015), and Biegon (2017). If ICT use for pedagogy is undervalued, its management application would face similar, if not greater, neglect - a systemic failure early policy measures failed to reverse. Yet, pockets of proactive adoption reveal significant latent gains: Wemba (2020a) and Chidimmaicheanye et al. (2019) documented marked improvements in planning and record accuracy where EMIS was used, proving untapped capacity and proven effectiveness despite national inertia.

Compounding this is Cameroon's peculiar and complex educational structure: a dual Anglophone and Francophone system fragmented across four ministries of education namely the Ministry of Basic Education (Ministère de l'Education de Base, MINEDUB), Ministry of Secondary Education (Ministère des Enseignements Secondaires, MINESEC), Ministry of Higher Education (Ministère de l'Enseignement Supérieur, MINESUP), and Ministry of Employment and Professional Training (Ministère de l'Emploi et de la Formation Professionnelle, MINEFOP (UNICEF, 2020). This institutional fragmentation poses a major challenge to the development of a properly coordinated EMIS, resulting in fragmented data management across ministries and the absence of an integrated platform to provide a comprehensive national picture. This context is critical given the World Bank's Cameroon Reform Support Project (P16096), which planned for the development and implementation of a national EMIS (2018–2022). Individual secondary schools nevertheless have some ICT applications for school administration; (Wemba, 2020a) carried out an appraisal on the use of EMIS and its effects on the effective management of schools in the Western Region of the country, findings from his study revealed that the use of EMIS significantly affects the planning of school events and processes in this region. It would appear from existing literature that national EMIS is still budding; this therefore requires substantial efforts in terms of research in order to build on existing efforts in this direction.

More recently the World Bank through its Cameroon Reform Support Project (P16096) planned for the development and implementation of a national EMIS within the period 2018 to 2022, following the diagnosis for both Basic and Secondary schools (UNICEF, 2020). This project document states that “UNESCO will play a key role in ensuring that the development of an integrated EMIS follows international norms and standards, which is critical for ensuring the reliability and comparability of data produced and the compatibility and links between EMIS and other systems used for public finance (Application Nationale Pour le Traitement Informatique et Logistique du Personnel de l'Etat, ANTILOPE) and the management of state personnel (Système Informatique de Gestion Intégré des Personnels de l'Etat et de la Solde, SIGIPES)”.

Despite two decades of policy intent, Cameroon confronts persistent systemic barriers including chronic power cuts, regulatory volatility, internet access below 40%, and negligible ICT training for administrators (Njouny, 2021; Wemba, 2020; Fomen, 2023). Though seminal works exist (Tetang, 2007; Wemba, 2020a), the research area remains largely unexplored, with no robust empirical baseline documented on EMIS availability and use in school administration especially in Mezam Division. Therefore, the intriguing question remains: Will the development of the national EMIS actually be tailored to meet the real information management needs of Cameroonian schools without sufficient empirical assessment of existing systems? This study thus seeks to answer this question by conducting an evaluative cross-sectional survey of secondary schools within Mezam Division. It will provide important additional baseline information that characterises existing EMIS availability and utilisation, thereby enabling technical experts to tailor the development of the national EMIS based on documented realities of Cameroonian schools.

Theoretical Underpinnings

This study is guided by an integrated theoretical framework designed to provide a comprehensive explanation for the adoption, diffusion, and ultimate use of Educational Management Information Systems (EMIS) in school administration. The framework is fundamentally grounded in a socio-technical perspective, in which EMIS is seen as a complex system of people, processes, and technology operating in synergy (Bernbaum & Moses, 2011; Laudon & Laudon, 2014a). This is a critical perspective, as it depicts that the mere technical availability of tools does not guarantee their successful integration into administrative practice.

The philosophical basis provided by Systems Theory dictates that phenomena are best understood through the holistic analysis of interacting components. This view is refined by Information System Theory, which defines EMIS functionally through its Input, Processing, and Feedback loops. Crucially, IS Theory highlights the obligatory human participation (Lederman & Johnston, 2007). Unlike automated systems, EMIS requires the administrator, who is the human actor, to interpret the information output, make informed decisions, and subsequently initiate the necessary feedback to modify the system. This central role of the user validates the necessity of addressing both EMIS availability (the technical component) and EMIS use (the social component) as distinct, yet interconnected, objectives.

Given that the human element is central to EMIS functionality, the framework relies on behavioural theories to explain the measured level of use and the variance observed across different administrators in the various schools. Factors affecting the acquisition and use of EMIS can be individual, collective, or a combination of both sets of motives; thus, different theoretical lenses are necessary.

The primary model for explaining adoption at the individual level is the Technology Acceptance Model (TAM) (Davis, 1989). TAM provides the direct psychological bridge from technical availability to actual use, predicting that an administrator's decision to employ EMIS tools is determined by two core beliefs: Perceived Usefulness (PU) that is whether they believe the EMIS will genuinely enhance their administrative duties and Perceived Ease of Use (PEOU) which refers to whether the system is simple and straightforward to operate. Although TAM presupposes system availability, it is important to note that PU and PEOU could be socially driven, such that system acquisition is also influenced by these factors. This implies that if the administrators of one school find a particular EMIS useful and easy to use, it will likely influence other schools to acquire and use the same system. Consequently, TAM's model is directly relevant to explaining quantitative findings in the case where the availability of EMIS tools is not proportionately matched to the actual use of the system; it predicts that low scores on these two perceptual dimensions will directly result in poor adoption, regardless of the system's technical capabilities.

Complementing this individual-level perspective is Diffusion of Innovation Theory (DOI), which situates the adoption process within the broader social system of schools. While TAM focuses on individual attitudes towards using technologies, DOI approaches system acceptance and use from group or organisational levels where an innovation spreads through social acceptance and influence. DOI moves the analysis beyond the individual to explain the varying patterns and rates at which EMIS spreads across a given system, which in this case will be the different types of secondary schools (public, lay-private, and mission schools). DOI posits that for an innovation to spread, the product must be reinvented to become 'easier, simpler, quicker, cheaper and more advantageous'; simply put, it must be user friendly and affordable (Robinson, 2009). Following this line of reasoning, instead of trying to persuade social groups (such as school administrators) to use an invention the way it is, it may be more pragmatic to vary the versions in such a way as to make it more adoptable. In this context, the factors that determine the rate of adoption of EMIS, which includes relative advantage, compatibility, simplicity, and ease of use, trialability, and observable results (Chia Cua & Garrett, 2010; Halawi & McCarthy, 2006), provide the basis for explaining observed variation in the use patterns across the different schools. Although DOI is typically used to categorise schools and their administrators into adopter categories (innovators to

laggards) based on a critical time element that eludes a cross-sectional survey, the concept of reinventing innovations to meet social needs in order to ease adoption is nevertheless important to provide logical explanations for the observed variations in use. Consequently, DOI provides the necessary context to understand why an available EMIS might be enthusiastically embraced by an early majority of schools while being resisted or ignored by others, thereby explaining the variance in adoption across the sampled schools.

This integrated approach, combining the socio-technical necessity of Systems Theory, the individual motivation explained by TAM, and the social diffusion patterns explained by DOI, ensures a nuanced analysis of how EMIS transitions from an available tool to an effectively embedded component of administrative practice.

Statement of Problem

In contemporary times school managers utilise quality information to manage schools efficiently and effectively; school information is managed through the use of computer-based EMIS to support a range of administrative activities such as admission and registration of learners, attendance monitoring, assessment records, reporting, financial management, staff allocation and management of all other resources. With a functional EMIS all educational stakeholders should be able to access relevant information about the school from the school administration through a clearly defined channel and in a timely manner for the purpose of effective decision making, policy planning and implementation, monitoring and evaluation of objectives at different levels which are antecedents of administrative effectiveness.

Quality information is the bedrock of proper decision making in all aspects of administrative function, this improves effectiveness and competitiveness of any organisation. Notwithstanding the improvement in technological provisions for school administration in Cameroon, the management of school information has remained an issue of concern at school and even national levels. Problems like poor data quality, variability in data completeness, lack of reliable data, lack of timely and valid information from the national EMIS, as well as varied forms of report formats have been identified by UNESCO.

The problem of deficiency in information management became obvious to the researcher while on practical placement during school visits to some secondary schools in Bamenda the capital city of the North West Region. The researcher observed that the school administration (principals and school secretaries) who should have all relevant school information handy, found it difficult to promptly provide information such as student enrollment status (past and present), staff capacity, and school performance in past national examinations (GCE, BEPC, Probatoire and Baccalauréat).

Also, during the prevailing crisis in the two English regions of the country where schooling has been greatly disrupted, it has been difficult to carry out school administrative activities which are essential to plan and execute the school year; staff meetings rarely hold due to the risk on ground. School administrators also suffer quite some difficulty in getting information to and from their staff, that is difficulty in communication; this problem became compounded during the COVID 19 pandemic that necessitated lockdown of businesses as well as schools. During this pandemic, while most schools slumped into complete shutdown of activities in almost the whole region and country others managed to continue their work remotely thanks to the use of modern technologies like EMIS and many others.

EMIS carries the potential to properly manage the problem of difficult communication and information dissemination which are paramount to administrative effectiveness; this can be done through the use of modern technology such as emails, webinars and WhatsApp chat forum. While some school administrators seem to readily sort out themselves and maintain cohesion of staff and students and proper liaison with school community with the use of these technological assets, others are apparently at a loss on how to integrate modern technology to enhance administrative effectiveness in school management.

What remains unclear is whether the limitation of school administration in managing school information is due to lack of availability and/or non-use of EMIS for information management in Mezam division of the North West Region.

This study will therefore attempt to provide a comprehensive empirical answer to this question through a descriptive cross-sectional survey as well inferential analysis to determine the influence of the availability and use of EMIS on effectiveness of school administration in information management.

Objective of the Study

The study generally examined the availability and use of EMIS by school administrators in secondary schools in Mezam Division, North West Region Cameroon. Specifically, the study focused on:

- Assessing the level of availability of EMIS tools in secondary schools' administrative offices in Mezam Division, North West Region.
- Evaluating the level of use of EMIS tools in secondary schools' administrative offices in Mezam Division, North West Region.

Research Hypotheses

The study tested the following null hypotheses (Ho).

- There is no significant difference in the availability of EMIS in public, lay private and confessional secondary schools in Mezam Division.
- There is no significant difference in the use of EMIS by administrative personnel in public, lay private and confessional secondary schools in Mezam Division.

Research methods

The study was conducted in Mezam Division, North West Region of Cameroon, the most populous English-speaking division. The area was selected for its relative accessibility despite the ongoing socio-political crisis that began in 2016, which has led to a decline in school populations and increased reliance on modern technologies for secure information access. Mezam comprises seven sub-divisions, but field access was restricted primarily to Bamenda I, II, and III, this influenced the sampling and data collection strategy. The research design employed was a mixed-methods QUAN (qual) nested explanatory design, prioritising a quantitative cross-sectional survey followed by a qualitative phase (Hurst, 2023). This structure allowed for measuring the prevalence of EMIS availability and use across a wide sample, while the subsequent interviews and observations of a subsample provided necessary contextual explanations for the quantitative findings. The target population consisted of all 158 secondary schools in Mezam Division, with principals and vice-principals as the primary units of observation. The accessible population (sampling frame) was constrained by the crisis to specific sub-divisions. The study employed a combination of techniques. For the quantitative phase, stratified proportionate sampling was used, categorising the population by ownership (public, lay private, confessional) and sub-division. The sample size was $n=113$, determined using the Krejcie and Morgan (1970) table. For the qualitative phase, purposive sampling was employed to select key informants, prioritising safety amid the crisis over random selection (Anol, 2012). Quantitative data were analysed using ANOVA to assess the variation in mean scores across the stratified groups (Public, Lay-private, and Confessional schools), directly testing the study's hypotheses.

The primary research instrument used for the quantitative phase was a comprehensive structured questionnaire designed to collect data on EMIS availability and use in secondary schools. The instrument utilised a mix of measurement scales. Part A was dedicated to collecting essential background data about the respondent (such as position/role) and the school (such as school ownership type and location). This data was crucial for stratification and contextualising the findings of Part B.

Part B addressed the core objectives of the study. Data on resource availability were captured through simple numerical counts, with respondents reporting the quantities of hardware items (e.g., laptops, servers) that were available and those that were functional. This provided direct quantification of the school's digital resource base, serving as the foundational metrics. Concurrently, data regarding the use of specific software and the operational capacity of personnel were recorded using a nominal scale of 'Yes' or 'No'.

The Interview Guide served as the core qualitative research instrument in the study's nested explanatory design (QUAN (qual)). It was designed to complement the questionnaire findings by providing rich, in-depth contextual explanations and exploring administrators' perceptions and challenges regarding EMIS availability and use.

This instrument was also divided into two parts: Part A was dedicated to administrative and ethical documentation, gathering background information on the interviewee, specifically their Job Position and Years at the Current School, which were essential variables for contextualising their narratives. This part also included an introductory protocol to establish rapport, state the research purpose, guarantee confidentiality, and affirm voluntary participation, ensuring adherence to ethical standards.

Part B focused on the research objectives concerning EMIS availability and use. This section comprised semi-structured, open-ended, and probing questions designed to elicit detailed qualitative narratives. The questions were specifically designed to provide depth to the quantitative findings, covering key areas such as perceived institutional readiness (in terms of hardware, software, and skilled personnel); identification of specific gaps and deficits; the availability of and satisfaction with specialised software beyond generic Microsoft packages; and the extent of use and frequency of updates of external communication tools (e.g., school websites or social media platforms).

The questionnaire yielded a score 0.933 for the Cronbach alpha reliability coefficient; which indicated an excellent reliability of the instrument thereby confirming its consistency and stability (George and Mallery, 2003).

The research instruments underwent rigorous validation to ensure reliability and accuracy. Face validity was established through reviews by the supervisor and a statistician, who assessed item relevance, clarity, and coding suitability. Content validity was confirmed by the supervisor and two expert judges, yielding a Content Validity Index (CVI) of 1.0 (4/4), far exceeding the 0.7 threshold. Construct validity was achieved by aligning all items with the study's objectives, questions, and hypotheses, with further refinement by the supervisor and statistician. Following these corrections and approvals, the questionnaire, interview guide, and discussion guide were deemed fully valid for fieldwork.

The data collected for this study comprised responses from closed-ended questionnaires (quantitative) and semi-structured interviews (qualitative). All data were subjected to rigorous analysis using appropriate statistical and qualitative methods to address the research objectives and hypotheses.

Quantitative data from the administered questionnaires were coded and entered into Microsoft Excel version 2021 for initial organisation and cleaning. The cleaned data were subsequently imported into the R software for statistical computing (R Core Teams, 2024) for statistical analysis. The analysis employed both descriptive and inferential statistical approaches: For the descriptive statistics frequencies and percentages were computed to summarise the demographic characteristics of the respondents, the reported availability of specific EMIS hardware and network components, and the self-reported level of use of EMIS software.

The inferential statistics involved a one-way Analysis of Variance (ANOVA) was used to test the study's hypotheses regarding the variability in the availability and use of EMIS tools across the three independent school types (Government, Lay Private, and Mission schools). The statistical significance for all inferential tests was assessed at a predetermined level of significance, denoted

as $\alpha = 0.05$. The decision rule was applied as follows: If the calculated p-value was less than the significance level ($p\text{-value} < \alpha$ or 0.05), the null hypothesis (H_0) was rejected, leading to the conclusion that a statistically significant difference (or relationship) exists. If the calculated p-value was greater than or equal to the significance level ($p\text{-value} \geq \alpha$ or 0.05), the null hypothesis (H_0) was not rejected (failed to reject), leading to the conclusion that no statistically significant difference exists.

Framework Analysis was used to structure and explain quantitative findings, explicitly linking them to the study's core objectives: EMIS availability and use (Ritchie & Lewis, 2003). The process began with familiarisation to establish the necessary explanatory context. A thematic framework was developed, anchored in the TAM and DOI models and the two research objectives. Data was coded and charted into matrices by school type for structured comparison. This enabled the final interpretation, serving the precise explanatory function of the qualitative component.

Findings

The study sample was drawn from a total population of 158 secondary school administrators across Mezam Division, with a targeted sample of 113 based on sub-strata allocations. Of these, 79 administrators responded, yielding a response rate of 70.0%. This participation varied across sub-divisions and school types, with Bamenda II and Bamenda III (Figure 13) showing higher representation (23% and 24%, respectively) with the least represented sub-division being Bamenda 1 (3.8%), Majority of the schools were Government schools (59%), followed by Lay private (30%) and Mission (10%) schools in that order (Figure 14). Majority of the respondents were males (85%), with only a few females (15%). The respondents were predominantly Principals (84%), followed by Vice-principal (15%) and Bursars (1.3%) in that order.

Assessment of the availability and use of EMIS tools was done with respect to availability and functionality of hardware, network connectivity, use of different software and persons (administrators) using EMIS.

Results (Table 1) revealed that more than half of the respondents (57%) reported no laptop while according to 58% of the respondents, all the available laptops were not functional.

Table 1 Respondents' perception on the level of availability of EMIS tools in secondary schools in Mezam

Hardware	Status	Number ranges and their frequencies						Total number of hardware
		0	01-10	11-20	21-50	51-99	>100	
Laptops	Available	45 (57%)	27 (34%)	3 (3.8%)	4 (5.1%)			270
	Functional	46 (58%)	27 (34%)	1 (1.3%)	5 (6.3%)			268
Desktops	Available	23 (29%)	28 (35%)	9 (11%)	13 (16%)	4 (5.1%)	2 (2.5%)	1323
	Functional	29 (37%)	26 (33%)	6 (7.6%)	11 (14%)	6 (7.6%)	1 (1.3%)	1189
Printers	Available	30 (38%)	49 (62%)					139
	Functional	36 (46%)	43 (54%)					106
Servers	Available	58 (73%)	20 (25%)	1 (1.3%)				43
	Functional	59 (75%)	20 (25%)					30
Photocopiers	Available	36 (46%)	43 (54%)					79
	Functional	44 (56%)	35 (44%)					58
Tablets	Available	67 (85%)	5 (6.3%)	3 (3.8%)	3 (3.8%)		1 (1.3%)	738
	Functional	66 (85%)	5 (6.4%)		3 (3.8%)	3 (3.8%)	1 (1.3%)	686
Scanners	Available	57 (72%)	22 (28%)					30
	Functional	59 (75%)	20 (25%)					27
Internet Modems	Available	57 (72%)	21 (27%)	1 (1.3%)				43
	Functional	60 (76%)	18 (23%)	1 (1.3%)				37

Computers connected with Local Area Network in the school	Available	66 (84%)	8 (10%)		2 (2.5%)	3 (3.8%)		325
	Functional	64 (81%)	11 (14%)	2 (2.5%)	1 (1.3%)	1 (1.3%)		203

Source: Researchers' computation September 2025

Majority of the respondents (35%) reported 1-10 desktops, but according to 37% of the respondents, all the available desktops were not functional. Majority of the respondents (62%) reported 1-10 printers while 54% of the respondents reported that 1-10 of the available printers were functional. According to most of the respondents (73%), they had no servers while majority of the respondents (75%) who had servers said they were not functional. More than half of the respondents (54%) reported that they had 1-10 printers of which none was functional based on the report of 56% of the respondents. Most of the respondents (54%) reported 1-10 available photocopiers but majority of the respondents (56%), reported that none of the available photocopiers was functional. A compelling majority of the respondents (85%) said that they had no tablets while the same proportion of respondents (85%) reported that none of the available tablets was functional. Majority of the respondents (72%) reported that they had no scanners while 75% of the respondents reported that all the available scanners were not functional. Most of the respondents (72%) reported that they had no internet modems while 75% of those who reported that they had internet modems said none was functional. An overwhelming majority of the respondents (84%) attested that they had no computers connected with Local Area Network in their school while a compelling majority of the respondents (81%) of the respondents reported that none of the available computers connected with LAN were functional.

School software were predominantly operated by Principals (52%) and the Secretaries (52%) with the least cited administrators being accountants (20%) (Table 2).

Table 2 Administrators who used EMIS software in secondary schools in Mezam Division

Administrator	Administrators who operate the school software in various capacities	Administrators use the school software from their personal devices
Principal	41 (52%)	25 (32%)
Vice-Principal	34 (43%)	21 (27%)
Information manager	19 (24%)	13 (16%)
Bursar	27 (34%)	15 (19%)
Accountant	16 (20%)	7 (8.9%)
Secretary	41 (52%)	21 (27%)

Source: Researchers' computation September 2025

Principals (32%) were the most cited administrators who use school software from their personal devices, followed by Vice-principals (27%) and Secretaries (27%) while the least cited administrators were the Accountants (8.9%).

The results in Table 3 show that most schools do not use any software for information management. Adoption of specialised EMIS software is notably low (2.6%), while software use is largely confined to generic applications, particularly Microsoft Excel (6.3%) and Microsoft Word (11.3%).

Table 3: EMIS software used in secondary schools in Mezam Division

Software Type	Frequency
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No software is used in the school	31 (39%)
Microsoft excel-specialised school software	2 (9.1%)
Specialised school information management software	7 (2.6%)
Spreadsheet- Microsoft excel	5 (6.3%)
Word processor- Microsoft word	9 (11.3%)
Spreadsheet- Microsoft excel	25 (32%)

Source: Researchers' computation September 2025

While most administrators reported the use of alternative software in managing school information (61%), social media particularly WhatsApp emerged as the dominant platform, adopted by 68% of respondents (Table 4). Email followed at 52%, while Facebook was used by 32%. In contrast, more formal or education-focused platforms were largely unavailable: only 14% maintained school websites, 7.6% used Telegram, 2.5% utilised Twitter, and a mere 3.8% employed Skype for information management purposes. Tools such as Zoom (22%) and PowerPoint (25%) saw moderate but still limited uptake.

Table 4 Use of other software or Apps for IM

Parameter	NO	YES
Use of other software or Apps to manage school information	31 (39%)	48 (61%)
WhatsApp	25 (32%)	54 (68%)
Email	38 (48%)	41 (52%)
Websites	68 (86%)	11 (14%)
Facebook	54 (68%)	25 (32%)
Telegram	73 (92%)	6 (7.6%)
Twitter	77 (97%)	2 (2.5%)
PowerPoint	59 (75%)	20 (25%)
Zoom	62 (78%)	17 (22%)
Skype	76 (96%)	3 (3.8%)

Source: Researchers' computation September 2025

Testing of hypothesis 1

Ho1: There is no significant difference in the availability of EMIS in public, lay private and confessional secondary schools in Mezam Division.

Table 5 Variation in the availability of EMIS across school types

Characteristic	Government	Lay Private	Mission	p-value ¹
Availability of EMIS tools (No. of hardware)	26.0 ± 58.9	58.0 ± 87.8	45.5 ± 31.4	0.2 ^{ns}
¹ One-way ANOVA				

ns Not significant at the 5% level of significance

Source: Researcher's computation 2025

As presented in Table 5, a one-way ANOVA revealed no statistically significant difference in the availability of EMIS tools (measured as the number of hardware items) across government, lay private, and mission secondary schools in Mezam Division ($p = 0.2$, not significant). Government schools recorded a mean of 26.0 ± 58.9 hardware items, lay private schools the highest at 58.0 ± 87.8 , and mission schools 45.5 ± 31.4 . Although lay private schools possessed on average more than twice the hardware of government schools, the substantial standard deviations and overlapping ranges resulted in a non-significant outcome. The result therefore provides clear empirical support for the Hypothesis Ho1: There is no significant difference in the availability of EMIS in public, lay private, and confessional secondary schools in Mezam Division; the hypothesis is accepted. This finding establishes that EMIS infrastructure is broadly comparable across the three school categories.

Qualitative analysis related to availability revealed a spectrum of readiness across the visited schools, with some still transitioning from manual to digital systems. While the quantitative data showed statistically non-significant differences in hardware counts, the qualitative data highlighted a significant perceptual divide regarding the quality and functionality of available resources. The expression of satisfaction with EMIS availability varied drastically by school type, with Lay Private schools showing the most satisfaction, often reporting sufficient hardware, software, networks, and "skilled persons." For instance, one administrator stated that "the school has all it takes in terms of computers, software, printers, skilled persons." Conversely, Government and Mission schools expressed limited satisfaction, with one blurted out complaint stating, "The school is largely lacking in hardware especially and to some extent in skilled persons for an effective EMIS."

Across all schools, two critical availability gaps emerged: a deficiency in internet supply, with one interviewee stating, "The major problem... is the lack of internet connectivity," and a severe limitation in software advancement. The software limitation was captured by the theme of functional constraints, where the systems were reported as "limited because the teachers cannot use it remotely," leading to delay and congestion at media centres. Furthermore, while most interviewed schools reported having specific specialised software (APLON, Schoolpro, STEM), a key finding was the lack of shared software networks, as discussions revealed that hardly any software was used by a network of schools, confirming that EMIS procurement remains an isolated school-by-school decision.

Testing of hypothesis 2

Ho2: There is no significant difference in the use of EMIS by administrative personnel in public, lay private and confessional secondary schools in Mezam Division.

Table 6 Variation in the use of EMIS across school types

Characteristic	Government	Lay Private	Mission	p-value ¹
Use of EMIS tools (Usage ratings)	2.2 ± 2.2	4.0 ± 2.5	3.3 ± 2.5	0.008**
¹ One-way ANOVA				

ns Not significant at the 5% level of significance

** Significant at the 1% level of significance.

Source: Researchers' computation 2025

Results of a one-way ANOVA in Table 6 above revealed statistically significant differences in the use of EMIS tools across the three categories of secondary schools in Mezam Division ($p = 0.008$, < 0.01). Lay private schools recorded the highest mean usage rating (4.0 ± 2.5), indicating substantially greater adoption and integration of EMIS tools in daily administrative tasks. Mission schools followed with a moderate mean rating of 3.3 ± 2.5 , while government schools displayed the lowest level of EMIS tool usage, with a mean of only 2.2 ± 2.2 . Hence, we reject the null hypothesis, retaining the alternative hypothesis, concluding that the use of EMIS tools varied significantly across school type. This marked disparity highlights that, despite comparable availability of infrastructure, government schools lag far behind their lay private and mission counterparts in actual utilisation of EMIS tools, underscoring a critical implementation gap in the public sector.

Content analysis of the interviews revealed use patterns with a dependence on accessible, high-compatibility tools, and a high degree of system fragmentation. The interviews corroborated the quantitative finding of high WhatsApp use, confirming it as the most used IM tool for communication amongst staff, with parents (including sending report cards), and with the Divisional delegation. Facebook, Zoom, and email were used to a lesser extent. The primary users of the EMIS were confirmed to be the Principals and Secretaries, and to some extent the Bursars.

The most significant finding concerning the level of use was the theme of system fragmentation. The interviews revealed that some EMIS were not an integral whole, with administrators explaining that the school bursars used a system completely different from what the secretaries or

information managers used. This meant that the software in the finance department was unrelated to the secretariat software. This fragmented use pattern was mirrored in the personnel organisation: some schools had delegated personnel for IM, others had different persons managing different types of information with no particular coordination, and some schools had no person particularly in charge, leaving IM to whomever was delegated at the time of need.

Discussion of findings

The respondent pool was strongly male-dominated (85% male, 15% female) and hierarchically concentrated, with principals comprising the vast majority (84%), followed by vice-principals (15%) and only one bursar (1.3%). This demographic composition mirrors the prevailing gender imbalance and top-heavy administrative structure in secondary school leadership across Mezam Division. Although the limited female representation may reflect broader systemic barriers rather than selection bias, it did not compromise data quality. On the contrary, the high participation of principals and vice-principals, precisely the officers responsible for information management, ensured that responses were authoritative, accurate, and directly informed by day-to-day administrative practice.

The qualitative and quantitative evidence from this study provided nuanced insights into the availability and usage of Education Management Information Systems (EMIS) across secondary schools in Mezam Division.

The study revealed a significant discrepancy between the availability and use of EMIS tools in secondary schools. Quantitative analysis indicated no statistically significant variation in EMIS availability across school types in Mezam Division. This unexpected equity in physical infrastructure challenges the common assumption that resource scarcity alone drives digital divides in education. Instead, the data reveal a more nuanced reality: while computers and peripherals existed in most administrative offices, a critical design–reality gap (Heeks, 2002) persisted. Schools often possessed acceptable levels of hardware yet suffered from outdated or feature-limited software, rendering tools functionally inadequate especially during high-demand periods such as report card preparation. This mismatch echoed Heeks’ framework, where technological design fails to align with operational demands, resulting in congestion at media centres and delayed administrative outputs. The pattern reflects the notion of EMIS as a socio-technical system, where both technological infrastructure and social dimensions (human skills, attitudes, motivation, and organisational culture) jointly determine system effectiveness (Laudon & Laudon, 2014). This finding underscores the core principle that while availability is a prerequisite for use, it does not guarantee effective or sustained utilisation.

Qualitative findings revealed a spectrum of technological adoption across schools. Lay private schools demonstrated more advanced stages of EMIS integration, while many government and mission schools remained in transitional phases, still relying partially or entirely on manual systems. This observation is consistent with existing literature that identifies institutional priorities and resource allocation as key determinants of ICT adoption in education (Nguyen, 2021; UNESCO, 2023). A particularly striking finding was the mismatch between hardware availability and software capability. While several schools had adequate computers and peripherals, the software often lacked advanced features, an echo of Heeks’ (2002) “design–reality gap leading to unsatisfactory delivery.” These limitations resulted in delays and congestion at media centres, highlighting a fundamental misalignment between the provided tools and the operational realities of the end-users.

Further complicating availability was the heterogeneous software landscape, with schools sometimes even within the same mission body using disparate, non-standardised platforms. This fragmentation not only increases costs but also limits opportunities for shared training and collective software improvements, thus undermining integrated data use (Bellinger, Castro, & Mills, 2004). From a systems theory perspective, such decentralisation reflected a low level of integration, which in turn limited opportunities for organisational learning, team-based problem solving, and collective intelligence (Senge, 1990; Senge, 1990a). These risks can be mitigated

through coordinated or collaborative procurement and shared-services models that leverage economies of scale in education systems (UNESCO-UIS, 2020; UK DfE, 2017; Ohio Auditor of State, 2019). Internet connectivity also emerged as a critical setback in EMIS tool availability amongst the secondary schools in Mezam, mirroring evidence from other developing contexts where broadband deficits hinder ICT's transformative potential (World Bank, 2021).

Significant differences emerged in actual use, with government secondary schools recording the lowest levels of EMIS usage. The disparity in usage between school types reflects patterns observed in other contexts, where factors like school type, funding and operational flexibility influence ICT adoption (Dawam et al., 2009; Cuartero & Role, 2018). This aligns with Contingency Theory (Lawrence & Lorsch, 1967). The data further indicated that despite some availability, the overall actual use of EMIS tools remained low across the various school types, a finding corroborated by Mutisya & Mwanja (2017). This disparity further demonstrates the classic "design–reality gap" (Heeks, 2002), where the absence of adequate social enablers such as training and skills results in underutilisation despite the presence of infrastructure.

The low usage in government schools can be attributed to perceptions of low usefulness (PU) and low ease of use (PEOU), which directly inhibited adoption despite tool availability because the tools were in most cases less than optimal in performance. In contrast, private schools' higher usage may be attributed to a stronger perception of EMIS usefulness, reinforced by a more supportive organisational environment. The Diffusion of Innovations theory (Rogers, 2003) highlights that low compatibility with existing manual processes and limited opportunities for trial likely contributed to this resistance. This resonates with Wemba's (2020) finding that principals lacked the skills for effective use.

In this fragmented environment, social media emerged as a complementary communication tool, with WhatsApp ranking highest in usage for staff communication and parent engagement. Administrators valued its PEOU and PU (Davis & Davis, 1989), as its intuitive interface and mobile compatibility made it a natural fit for daily communication in resource-constrained environments (Nguyen, 2021). This suggests that EMIS adoption could be enhanced by incorporating similar user-centred design principles. However, the informal use of platforms like WhatsApp for official school processes raises serious concerns regarding data security, privacy, and institutional control (Mabaso et al., 2023; Moyano, Rojas Navarro, & Domenech, 2023).

Another instance of system fragmentation from the study's data showed that different departments used unrelated systems for finance, student records, and assessment data, creating silos and redundancies. Orlikowski (2000) argues that this is rooted in the organisational arrangements and enacted routines, rather than in limitations of the technology itself. EMIS functions were often concentrated in the hands of a few individuals (principals, secretaries, bursars), with little evidence of a dedicated information management role.

Overall, the qualitative evidence complemented the quantitative data, reinforcing that EMIS adoption is not simply a matter of technological availability but of the strategic alignment between technological capacity, user competency, and institutional design.

Conclusion and Recommendations

In conclusion, this study provides a pioneering evidence base for Mezam Division by achieving its two central objectives. The findings reveal a pivotal paradox; while a baseline availability of EMIS tools was observed across all school types, a significant and concerning gap emerged in their actual utilisation. Notably, government schools exhibited the lowest levels of EMIS adoption, highlighting that infrastructure alone is not sufficient to drive technology integration. The qualitative evidence underscored this, revealing that administrators still heavily rely on manual and informal systems like WhatsApp for critical tasks, creating silos and a fragmented data landscape. These results underscore a core paradox: the problem is not technological deficiency but a critical misalignment between available EMIS tools and the human, organisational, and socio-technical ecosystem. The path to effective educational administration

therefore lies not merely in providing hardware and software, but in systematically addressing the systemic and human factors that inhibit sustained EMIS integration.

EMIS tools exhibited moderate availability across government, lay private, and mission secondary schools in Mezam Division, with no statistically significant difference in their distribution. Since, this baseline availability fails to translate into meaningful utilisation, as functionality limitations, inadequate system readiness, and low digital literacy among users emerge as the primary impediments; a number of measures need to be taken by different educational stakeholders. The persistent gap between “having” and “using” EMIS underscores that mere provision of hardware and software is insufficient without concurrent investments in usability, maintenance, and human capacity. To convert this moderate availability into a robust, functional platform for digital school administration, targeted and coordinated interventions are essential, as outlined in the recommendations below.

The Ministry of Secondary Education (MINESEC) should enforce a national minimum EMIS infrastructure standard, mandating regular audits and phased upgrades of hardware (computers, printers, and backup power systems) to eliminate obsolete equipment. Development partners and donors are urged to finance targeted infrastructure grants, prioritising schools with the highest deficits, while introducing shared regional server hubs to reduce individual school costs. Technical developers must design low-cost, offline-capable EMIS modules that function reliably on existing hardware, incorporating automatic update mechanisms and cloud synchronisation once connectivity improves. School administrators should conduct annual hardware inventories and collaborate with PTAs to mobilise local resources for minor upgrades, ensuring every administrative office meets the minimum operational threshold for EMIS deployment.

Despite comparable availability, actual utilisation varied significantly by school type, with government schools recording the lowest usage. Heavy reliance on WhatsApp and other generic apps further confirms that specialised EMIS tools remain severely underutilised due to poor network connectivity or complete lack of these specialised EMIS software. Building directly on the improved availability recommended above, the following measures target sustained and inclusive use:

MINESEC should launch a mandatory EMIS utilisation framework with clear key performance indicators (KPIs) for principals, coupled with performance-based incentives and sanctions to shift from partial to full integration. A train-the-trainer programme must be rolled out immediately, targeting at least two staff members per school to decentralise access beyond principals and foster collaborative data entry. Technical developers should embed user-friendly dashboards, multilingual interfaces, and mobile-compatible versions into EMIS platforms to lower the adoption barrier, while integrating direct WhatsApp-to-EMIS data bridges during the transition period. School administrators are required to establish weekly EMIS practice sessions, peer-mentoring circles, and digital notice boards to normalise tool use among all staff. Finally, parents and PTAs should be granted read-only access to key reports via simplified portals, creating external demand that compels administrators to maintain active, accurate EMIS engagement. These interdependent steps first securing reliable infrastructure, then driving intensive usage will close the availability-use gap and unlock EMIS as a transformative tool for educational governance in Mezam Division.

Ultimately, the path to transformative educational administration lies beyond mere infrastructure provision. Sustained EMIS integration demands coordinated action: enforceable national standards, targeted capacity building, user-centred software design, and inclusive stakeholder engagement. By systematically bridging the socio-technical divide, Cameroon can unlock EMIS as a powerful engine for evidence-based governance, accountability, and equitable educational progress in Mezam Division and beyond.

References

1. Abdul-Hamid, H., Mintz, S., & Saraogi, N. (2015). *From compliance to quality: How education management information systems can help*. World Bank.
2. Adhikari, R., & Budhathoki, C. B. (2025). Policy dysregulation and EMIS implementation in low-resource contexts. *Journal of Educational Administration and Policy Studies*, 17(2), 45–59.
3. Aldarbesti, H., & Saxena, J. P. (2014). Information as a strategic asset in educational organisations. *International Journal of Information Management*, 34(5), 612–620.
4. Ampofo, C. (2020). Barriers to ICT integration in Ghanaian secondary schools: A case of manual record-keeping persistence. *African Journal of Education and Technology*, 10(1), 33–47.
5. Anol, B. (2012). Purposive sampling in crisis-affected research contexts. *Journal of Social Research Methodology*, 15(3), 221–235.
6. Beignon, M. (2017). *ICT infrastructure and administrative use in Kenyan secondary schools*. UNESCO Nairobi Office.
7. Bellinger, G., Castro, D., & Mills, A. (2004). *Data, information, knowledge, and wisdom*. Systems Thinking. <http://www.systems-thinking.org/dikw/dikw.htm>
8. Bernbaum, M. (2011). *EMIS fundamentals: A guide for education planners and managers*. USAID.
9. Bernbaum, M., & Moses, K. (2011). Socio-technical dimensions of education management information systems. *International Journal of Educational Development*, 31(4), 345–352.
10. Bessick, J. (2016). Information management as a strategic organisational resource. *South African Journal of Information Management*, 18(1), 1–8.
11. Chia Cua, F., & Garrett, T. C. (2010). Diffusion of innovations in educational settings: A review. *Educational Technology Research and Development*, 58(3), 321–340.
12. Cuartero, A., & Role, J. (2018). EMIS as a tool for sector-wide educational planning. *Philippine Journal of Education*, 97(2), 112–130.
13. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
14. Dawam, S. U., Ojo, S. O., & Adebimpe, O. A. (2009). Factors influencing ICT adoption in Nigerian schools. *African Journal of Computing & ICT*, 2(1), 45–56.
15. Detlor, B. (2010). Information management. *International Journal of Information Management*, 30(2), 103–108.
16. Fomen, K. N. (2023). ICT training deficits and administrative digitalisation in Cameroonian secondary schools. *Cameroon Journal of Education*, 12(1), 88–104.
17. George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Allyn & Bacon.
18. Haji, S. A., Moluayonge, G. E., & Park, W. Y. (2017). ICT utilisation in Cameroon: Less than optimal. *Journal of African Education Studies*, 5(2), 201–215.
19. Halawi, L., & McCarthy, R. (2006). Measuring faculty perceptions of EMIS adoption using Rogers' diffusion model. *Issues in Information Systems*, 7(1), 103–108.
20. Harsh, S. (n.d.). *Management information systems: Evolution and applications*. Michigan State University Extension.



21. Heeks, R. (2002). Information systems and developing countries: Failure, success, and local improvisations. *The Information Society*, 18(2), 101–112. <https://doi.org/10.1080/01972240290075039>
22. Horton, F. W., Jr. (1979). *Information resources management: Concept and cases*. Association for Systems Management.
23. Hurst, S. (2023). Mixed-methods QUAN(qual) nested explanatory designs in educational research. *International Journal of Research & Method in Education*, 46(2), 145–160.
24. Husein, S. (2014). Education management information systems: A global perspective. *International Education Journal*, 13(1), 45–56.
25. Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.
26. Laudon, K. C., & Laudon, J. P. (2014). *Management information systems: Managing the digital firm* (13th ed.). Pearson.
27. Lawrence, P. R., & Lorsch, J. W. (1967). *Organization and environment: Managing differentiation and integration*. Harvard Business School Press.
28. Luena, R. (2012). EMIS adaptability and institutional capacity in developing countries. *UNESCO Working Paper Series*, No. 12.
29. Mabaso, C. M., Tembe, P., & Mutambara, E. (2023). WhatsApp as an administrative tool in South African schools: Data privacy concerns. *South African Journal of Education*, 43(1), Article 2156.
30. Moyo, M., Rojas Navarro, S., & Domenech, M. (2023). Risks of informal digital platforms in educational administration. *Digital Education Review*, 43, 112–130.
31. Mugo, P., Khalifa, M., & Bomani, M. (2017). The design–reality gap in EMIS implementation in sub-Saharan Africa. *Electronic Journal of Information Systems in Developing Countries*, 80(1), 1–18.
32. Mutisya, D., & Mwanja, J. (2017). ICT integration in school management: Evidence from Kenyan secondary schools. *Journal of Education and Practice*, 8(15), 112–120.
33. NESIS/UNESCO Wako, T. N. (2003). *Education management information systems in Africa: A guide*. UNESCO.
34. Nganjiozor, M. (2016). EMIS as a comprehensive data management framework. *African Education Review*, 13(3–4), 89–104.
35. Nguyen, T. H. (2021). Institutional priorities and ICT adoption in Vietnamese secondary schools. *Asia Pacific Education Review*, 22(4), 689–704.
36. Njouny, M. E. (2021). Power outages and internet penetration as barriers to EMIS in Cameroon. *West African Journal of Educational Technology*, 9(2), 55–70.
37. Ohio Auditor of State. (2019). *Shared services in education: Best practices*. <https://ohioauditor.gov/references/sharedservices.html>
38. Opoku, D. (2015). Information as a competitive resource in educational organisations. *Journal of Educational Management*, 7(1), 23–34.
39. Orlikowski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science*, 11(4), 404–428.
40. R Core Team. (2024). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>



41. Reza, M. H., Khan, M. H., & Rahman, M. (2013). Evolution of management information systems. *International Journal of Computer Applications*, 72(12), 34–41.
42. Ritchie, J., & Lewis, J. (2003). *Qualitative research practice: A guide for social science students and researchers*. Sage Publications.
43. Robinson, L. (2009). A summary of diffusion of innovations. *Enabling Change*. <http://www.enablingchange.com.au>
44. Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.
45. Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. Doubleday.
46. Senge, P. M. (1990a). The leader's new work: Building learning organizations. *Sloan Management Review*, 32(1), 7–23.
47. Shah, M. (2014). Evolution of school administrative software from the 1980s. *Journal of Educational Computing Research*, 50(4), 489–508.
48. Tetang, T. J. (2007). ICT in education in Cameroon: From policy to practice. *Ministry of Secondary Education Report*.
49. UK Department for Education. (2019). *Realising the potential of technology in education: A strategy for education providers and the technology industry*. <https://bit.ly/UK-EdTech-2019>
50. UNESCO. (2018). *Education management information systems: Global guidelines*. UNESCO.
51. UNESCO. (2019). *Data quality issues in education management information systems in developing countries*. UNESCO Institute for Statistics.
52. UNESCO. (2020). *EMIS constraints in low-resource environments*. UNESCO Institute for Statistics Working Paper.
53. UNESCO. (2023). *Digital transformation in education: Institutional priorities and adoption gaps*. UNESCO.
54. UNESCO-UIS. (2020). *Shared services models for EMIS: Lessons from global practice*. UNESCO Institute for Statistics.
55. UNICEF. (2020). *Cameroon education sector analysis: Towards an integrated EMIS*. UNICEF Cameroon.
56. Villanueva, C. (2003). *Education management information systems: A framework for developing countries*. World Bank.
57. Weedmark, D. (2019). History of information management systems: From punch cards to modern MIS. *Tech Journal Review*, 22(4), 101–115.
58. Wemba, M. C. (2020). Appraisal of EMIS use and its effects on school management in Western Region, Cameroon. *Cameroon Journal of Educational Management*, 8(1), 45–62.
59. World Bank. (2021). *Broadband deficits and digital education in developing countries*. World Bank Education Series.
60. Zaman, U., Jabbar, Z., Nawaz, S., & Abbas, M. (2019). Information as a strategic asset in organisational performance. *Journal of Business Research*, 102, 45–56.
61. Zhejiang, L., & Ngo, T. T. (2016). Policy foundations of ICT in Cameroonian education (2000–2015). *African Journal of ICT Policy*, 4(2), 78–94.