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**Digital Technologies and Secondary School Management Efficiency: The Role of  
Communication Tools and Learning Management Systems**

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## **Abstract**

The growing digitalisation of education has expanded the role of technology beyond classroom instruction to the management and governance of schools. Digital communication tools and Learning Management Systems (LMS), in particular, offer opportunities for improving information flow, stakeholder coordination, administrative processes and data-informed decision-making. Yet, the extent to which these technologies translate into management efficiency remains context-dependent, especially in resource-constrained educational systems where connectivity, digital competence and institutional readiness remain uneven. This study examined the relationship between digital technologies and secondary school management efficiency, focusing specifically on digital communication tools and LMS. The empirical investigation was conducted in selected secondary schools in Buea Municipality, South West Region of Cameroon. The analyses drew on a teacher dataset ( $N = 254$ ) and a separate administrator dataset ( $N = 20$ ). Data were collected using structured questionnaires containing closed- and open-ended items and analysed using descriptive statistics, Spearman's rank-order correlation and qualitative thematic categorisation of recurrent open-ended responses. Findings showed that digital communication tools were positively and significantly associated with management efficiency among teachers ( $r_s = .511$ ,  $p < .001$ ) and administrators ( $r_s = .630$ ,  $p < .001$ ). LMS adoption showed stronger positive relationships with management efficiency among teachers ( $r_s = .721$ ,  $p < .001$ ) and administrators ( $r_s = .761$ ,  $p < .001$ ). Respondents associated these technologies with improved communication, coordination, planning, monitoring, stakeholder interaction and reduced dependence on manual processes. However, unreliable connectivity, inadequate access to devices, unstable electricity supply, limited digital competence and insufficient LMS training constrained effective use. The study concludes that digital technologies can strengthen secondary school management efficiency when technological availability is accompanied by user competence, institutional support and purposeful integration into routine management practices.

**Keywords:** digital technologies; digital communication tools; Learning Management Systems; management efficiency; secondary school management; Cameroon

## **1.0 Introduction**

Efficient management remains fundamental to the capacity of secondary schools to deliver quality education in increasingly complex institutional environments. Contemporary school administrators are required to coordinate personnel, manage student and institutional information, communicate with multiple stakeholders, monitor academic activities, allocate resources and make timely decisions while responding to growing demands for accountability and educational quality. These responsibilities have expanded the meaning of school management efficiency beyond the routine execution of administrative tasks to include the capacity to organise information, coordinate institutional processes, reduce administrative delays and deploy available resources effectively towards educational goals. Within this changing environment, digital technologies are increasingly recognised as important resources for strengthening communication, information management, collaboration and administrative decision-making in schools (Kombo & Mwila, 2024; Msafiri et al., 2023).

The increasing digitalisation of education has consequently extended the application of technology beyond classroom instruction to school leadership and administration. Digital technologies provide opportunities for automating or simplifying administrative processes, facilitating information exchange, maintaining institutional records and strengthening interaction among administrators, teachers, students and parents. In secondary education, ICT integration has been associated with improvements in access to information, collaboration, resource sharing and institutional processes, although these benefits depend considerably on the manner in which technologies are integrated into school practices (Msafiri et al., 2023). More recent evidence similarly suggests that digital technologies can strengthen record keeping, communication and resource management in secondary school administration, while deficiencies in infrastructure, digital competence and technical support can restrict their effective utilisation (Kombo & Mwila, 2024). Digitalisation should therefore not be understood simply as the acquisition of technological devices; rather, it involves the purposeful incorporation of digital resources into organisational processes in ways that improve how schools function.

This distinction is particularly important because the availability of technology does not necessarily translate into management efficiency. Effective digital integration requires an enabling combination of technological infrastructure, professional competence, institutional support and users' willingness to incorporate technology into routine practices. Systematic reviews of ICT integration in secondary education have identified inadequate resources, insufficient training, limited technical support and difficulties in maintaining technological systems among the recurrent barriers to meaningful technology use (Msafiri et al., 2023; Msambwa & Daniel, 2024). The management value of digital technologies is therefore conditional: technology becomes organisationally useful when administrators and other school actors can access it, understand it and integrate it consistently into communication, coordination, monitoring and decision-making processes.

Among the digital resources with immediate implications for school administration are digital communication tools. These include email, instant-messaging applications, social-media platforms, school websites and videoconferencing applications through which information can be exchanged synchronously or asynchronously. Their significance for management derives from the centrality of communication to organisational functioning. School administrators routinely need to communicate

directives, coordinate staff activities, interact with parents, circulate information, obtain feedback and respond to emerging situations. Digital communication tools can reduce the temporal and geographical limitations associated with exclusively face-to-face or paper-based communication and can consequently strengthen institutional responsiveness. Evidence from African secondary-school settings indicates that ICT-supported communication can improve administrative coordination and information exchange, although its effectiveness remains influenced by connectivity, availability of devices and users' technological competencies (Eponge et al., 2024; Kombo & Mwila, 2024).

The administrative importance of digital communication is especially evident where school management depends upon continuous interaction among multiple stakeholders. Parents require information about students' attendance, behaviour and academic progress; teachers require timely administrative directives and opportunities for professional coordination; and school leaders require efficient channels through which information can be collected, disseminated and acted upon. Digital communication can therefore contribute to management efficiency not simply by making communication faster, but by improving the timeliness, reach, coordination and responsiveness of institutional information flows. Nevertheless, unequal access to digital devices, unstable internet connectivity, inadequate digital literacy and resistance to technological change can create new communication inequalities even as schools attempt to overcome traditional administrative limitations (Msafiri et al., 2023; Msambwa & Daniel, 2024).

Alongside digital communication platforms, Learning Management Systems (LMS) have become increasingly important components of the digital educational environment. Although conventionally associated with the organisation and delivery of teaching and learning, LMS platforms possess functions that intersect considerably with school management. They provide centralised environments for organising instructional resources, assignments and assessments; communicating with students; monitoring participation and academic activities; and maintaining information that may support administrative monitoring and coordination. Systematic evidence from secondary education demonstrates that LMS platforms such as Moodle can support the organisation, delivery, assessment and monitoring of learning activities while strengthening interaction within the educational environment (Msafiri et al., 2023). Their significance therefore extends beyond pedagogy to the organisation of processes through which teaching, monitoring, communication and academic administration are coordinated.

From a management perspective, this dual pedagogical-administrative character makes LMS particularly relevant. A properly integrated LMS can reduce dependence on fragmented paper-based procedures, centralise information, provide more accessible records of educational activities and facilitate communication among administrators, teachers and learners. At the same time, LMS adoption is more organisationally demanding than simply opening an account on a digital platform. Meaningful utilisation requires technological access, digital competence, training, institutional support and willingness among teachers and administrators to adjust established working practices. Research on ICT integration consistently demonstrates that professional development, reliable resources, supportive leadership and appropriate technical assistance are important conditions for sustained digital adoption (Msafiri et al., 2023; Msambwa & Daniel, 2024). Consequently, the presence of an LMS cannot itself be regarded as evidence of digital transformation; its contribution depends on the extent to which it becomes embedded in the operational processes of the school.

These issues assume particular importance in African educational systems, where the opportunities associated with educational digitalisation coexist with considerable infrastructural and institutional inequalities. Digital technologies offer possibilities for overcoming administrative inefficiencies, expanding access to information and strengthening school-stakeholder relationships, but these possibilities operate within environments characterised by uneven connectivity, constrained financial resources, inadequate equipment and variations in digital competence. Evidence from Tanzania, for example, indicates that school administrators generally recognise the potential of ICT to strengthen record keeping, communication and resource management, even while inadequate infrastructure and other implementation constraints limit effective utilisation (Kombo & Mwila, 2024). Broader systematic evidence similarly suggests that sustainable ICT integration requires a systemic approach involving infrastructure, capacity development, technical support, appropriate policy and stakeholder participation rather than isolated technological interventions (Msafiri et al., 2023; Msambwa & Daniel, 2024).

Cameroon reflects many of these opportunities and constraints. Digital technologies have increasingly entered secondary school administration, but their availability and utilisation remain uneven across institutions. Earlier empirical evidence from public secondary schools in Buea Municipality found only average availability of ICT resources and average utilisation of these technologies in human-resource, physical-resource and financial administration (Njouny, 2021). More recent evidence from Catholic secondary schools in the South West Region indicates that ICT can strengthen administrative management and institutional productivity, while simultaneously highlighting contextual factors that affect effective utilisation (Eponge et al., 2024). The emerging Cameroonian evidence therefore suggests that digitalisation is becoming increasingly relevant to secondary school management, but the transition from technological availability to sustained administrative efficiency remains incomplete.

This situation creates an important empirical and conceptual problem. Much of the literature on educational technology has traditionally concentrated on technology-supported teaching and learning, student achievement and teachers' classroom integration of ICT (Msafiri et al., 2023; Msambwa & Daniel, 2024). Although research on digital administration is expanding, less attention has been given to how specific categories of digital technology perform distinct management functions within secondary schools, particularly in resource-constrained contexts. Treating digital technology as a single undifferentiated construct can conceal these differences. Digital communication tools primarily strengthen information exchange, stakeholder interaction and coordination, whereas LMS combine communication with the organisation, documentation and monitoring of teaching and learning processes. Examining these dimensions separately can therefore provide a more nuanced understanding of how digital technologies relate to school management efficiency.

The problem is particularly pertinent in Buea Municipality, where schools operate within a context in which digital technologies are increasingly used but where infrastructural and capacity constraints remain evident. The original empirical investigation found substantial utilisation of digital communication tools but also identified poor network connectivity, unstable electricity supply, inadequate access to devices and insufficient technological competence among some users as barriers to effective use. Similarly, LMS adoption was perceived to improve the organisation and communication of school activities, planning, parental involvement and the reduction of manual processes, yet unreliable connectivity, inadequate training, resistance to adoption and limited access

to technological tools constrained implementation. These conditions expose an important tension: secondary schools may increasingly adopt digital technologies without necessarily possessing the institutional capacity required to convert their availability into sustained management efficiency.

Against this background, the present study examines digital technologies and secondary school management efficiency, drawing empirical evidence from selected secondary schools in Buea Municipality, South West Region of Cameroon. Rather than treating digital technology as a homogeneous phenomenon, the study concentrates on two functionally important dimensions—digital communication tools and Learning Management Systems—and investigates how each relates to management efficiency. By doing so, the study contributes context-sensitive evidence to the growing literature on technology-enabled school administration and responds to the need to understand not simply whether schools are becoming digital, but how particular digital technologies contribute to the organisation, communication, coordination and management of secondary schools within resource-constrained environments.

Accordingly, the study pursued the following specific objectives:

1. To examine the relationship between digital communication tools and secondary school management efficiency.
2. To assess the relationship between Learning Management Systems and secondary school management efficiency.

## **2.0 Literature Review**

The growing integration of digital technologies into educational institutions has expanded scholarly interest from technology-supported instruction to the broader implications of digitalisation for school leadership, administration and organisational performance. Schools increasingly employ digital technologies for managerial, administrative, pedagogical and communicative purposes, requiring school leaders to develop competencies that extend beyond conventional administrative practice (Wollscheid et al., 2025). Recent scholarship nevertheless suggests that digital school leadership remains an emerging and relatively fragmented field, with considerable scope for more context-sensitive evidence on how particular technologies influence specific dimensions of school functioning (Wollscheid et al., 2025). Similarly, systematic evidence indicates that ICT can improve administrative efficiency through automation of routine processes, data-supported decision-making and more responsive stakeholder communication, although these benefits remain dependent on infrastructure, institutional capacity and appropriate implementation (Liu et al., 2025).

Against this background, the present review conceptualises digital technologies not simply as technological artefacts but as organisational resources whose value depends on how they are incorporated into school management processes. The review proceeds from the dependent variable, secondary school management efficiency, before examining digital technologies generally and subsequently focusing on the two dimensions central to the study, digital communication tools and Learning Management Systems. This approach permits consideration of both the technological possibilities and the organisational conditions through which digital tools may contribute to efficient secondary school management.



## **2.1 Secondary School Management Efficiency**

Management efficiency in secondary education concerns the capacity of school administrators to organise and utilise available human, material, financial, informational and technological resources in ways that facilitate the timely and effective attainment of institutional objectives. Although efficiency is sometimes interpreted narrowly as minimising expenditure or accomplishing tasks with fewer resources, contemporary educational management requires a broader conception. An efficiently managed school must not only economise resources but also coordinate personnel and activities, maintain accurate information, communicate effectively with stakeholders, monitor educational processes, respond promptly to institutional needs and support informed decision-making. Efficiency therefore reflects the relationship between resources, administrative processes and organisational outcomes, rather than cost reduction alone.

This broader interpretation is especially important because schools are complex social organisations whose effectiveness depends upon the coordination of multiple actors and processes. Administrators work with teachers, students, parents, support personnel, education authorities and community stakeholders, each of whom generates and requires information. Communication delays, fragmented records, duplicated administrative procedures or difficulties retrieving information can therefore reduce efficiency even where adequate financial or human resources are available. Effective communication is consequently integral to school management because it facilitates coordination, feedback, collaboration and the maintenance of productive relationships among administrators, teachers, students and parents (Ndoh, 2025). Management efficiency can thus be observed partly through the speed, accuracy and reliability with which information moves through the organisation and supports appropriate administrative action.

Another important dimension of management efficiency is the organisation and execution of routine administrative processes. Secondary schools continuously undertake activities related to student records, attendance, assessment, timetabling, staff coordination, reporting, resource allocation and communication with parents and educational authorities. Where such activities depend heavily on fragmented or repetitive manual procedures, administrators may devote considerable time to operational tasks at the expense of planning, supervision and institutional improvement. Liu et al. (2025), in a systematic scoping review of ICT and educational administration, found that automated systems can streamline routine administrative activities and create greater opportunity for administrators to concentrate on strategic functions. Efficiency in this sense involves reducing avoidable administrative burdens while preserving accuracy, accountability and quality.

Information management and decision-making constitute a further dimension of secondary school management efficiency. School leaders routinely make decisions concerning student performance, staff deployment, resource allocation, discipline, planning and institutional priorities. The quality and timeliness of such decisions depend substantially on the accessibility and reliability of information. Liu et al. (2025) observe that ICT-supported administration can strengthen data-driven decision-making by facilitating the analysis of student-performance and resource-utilisation information, thereby supporting forecasting and more informed allocation of resources. Consequently, management efficiency entails not merely possessing administrative information, but ensuring that relevant information can be retrieved, interpreted and translated into timely decisions.

Efficient school management also requires stakeholder responsiveness. Parents increasingly expect timely information concerning students' attendance, academic progress and behaviour, while teachers require clear directives, schedules and feedback from administrators. Educational authorities similarly depend on accurate institutional reports for planning and oversight. Digitalisation has made the speed and responsiveness of these exchanges increasingly significant. Liu et al. (2025) found that online platforms can facilitate more immediate interaction among administrators, teachers, students and parents, thereby strengthening transparency and responsiveness in school administration. In Cameroon, Ndoh (2025) similarly emphasises the importance of effective communication to collaborative relationships and school management within secondary schools in the North West and South West Regions. These perspectives indicate that management efficiency possesses an important relational dimension: a school may have adequate internal procedures but remain administratively inefficient where communication with key stakeholders is delayed, fragmented or unreliable.

The concept also incorporates the efficient utilisation of institutional resources. Resource efficiency involves deploying staff, time, finances, infrastructure and information in ways that maximise their contribution to school objectives while limiting avoidable wastage. This is particularly significant in resource-constrained educational environments, where administrators frequently operate with inadequate infrastructure and limited financial and technological resources. Evidence from Catholic secondary schools in the South West Region of Cameroon indicates that ICT use can contribute to administrative efficiency and productivity, particularly through improved administrative processes and information management (Eponge et al., 2024). Similarly, recent evidence from Cameroon suggests that digital mobile learning platforms can contribute to administrative coordination and resource utilisation, although the relationship between technological investment and organisational efficiency remains conditioned by institutional circumstances (Hamadou, 2025). These findings suggest that efficiency should not be equated with the mere availability of resources; rather, it concerns the capacity to organise and use available resources productively.

The increasing digitalisation of schools has consequently added a technological dimension to the meaning of management efficiency. Contemporary school administrators are expected not only to manage conventional institutional resources but also to determine how digital systems can improve administrative routines, communication, information management and decision-making. Research on digital school leadership shows that schools increasingly use digital resources for managerial, administrative, educational and communicative purposes, thereby creating new competencies and responsibilities for school leaders (Wollscheid et al., 2025). Digital competence and technological leadership are therefore becoming intertwined with management efficiency because administrators must decide what technologies to adopt, how they should be integrated into institutional routines and how staff should be supported to use them productively.

Nevertheless, technology should not be treated as inherently efficiency-enhancing. Digital systems may introduce additional costs, technical difficulties, information-security concerns or inequalities where infrastructure and human capacity are inadequate. Liu et al. (2025) identify unreliable internet infrastructure, outdated equipment, data-privacy concerns and the digital divide among the factors capable of limiting the administrative benefits of ICT. Likewise, Ajani and Dlomo (2025), examining school administration in rural South Africa, found that inadequate ICT infrastructure, limited technological access and insufficient training and support constrained the effectiveness of a digital school administration and management system. Management efficiency in a digital environment

therefore depends upon the interaction between technology, people, organisational processes and enabling institutional conditions, rather than technological adoption in isolation.

Within the present study, secondary school management efficiency is consequently understood as the extent to which school management processes facilitate timely communication, administrative coordination, organisation and monitoring of school activities, stakeholder interaction, reduction of unnecessary manual procedures and timely decision-making through effective use of available resources. This operational understanding is deliberately aligned with the empirical evidence generated by the original study rather than imposing a broader efficiency construct that was not actually measured. The original investigation assessed management outcomes including improved staff communication, reduced time spent on administrative tasks, monitoring of students, parent collaboration, decision-making and organisation of school activities. The LMS evidence similarly addressed organisation and communication of activities, planning, parental involvement and reduction of manual processes.

Accordingly, management efficiency in this article is neither conceived purely as financial efficiency nor reduced to examination performance. It is treated principally as administrative and organisational efficiency: the capacity of secondary schools to communicate, coordinate, organise, monitor and make decisions in a timely and resource-conscious manner. This conceptualisation provides the basis for examining whether digital technologies, and specifically digital communication tools and Learning Management Systems, strengthen the processes through which secondary schools are managed.

## **2.2 Digital Technologies in Secondary School Management**

Digital technologies have become increasingly embedded in the organisation and administration of contemporary schools, transforming how information is generated, communicated, stored and used in institutional decision-making. In educational management, digital technology encompasses electronic devices, applications, platforms, networks and information systems employed to support administrative, communicative, instructional and decision-making processes. Its relevance to school management therefore extends beyond the availability of computers or internet connectivity to the purposeful integration of technological resources into organisational routines. Recent scholarship on digital school leadership confirms this broader understanding, showing that digitalisation increasingly intersects with leadership, organisational development, communication and institutional transformation rather than functioning solely as a classroom innovation (Wollscheid et al., 2025).

The movement towards digitally supported school management reflects the increasing complexity of educational administration. Traditional administrative procedures have often relied heavily on paper records, physical meetings, manual reporting and face-to-face communication. Although these mechanisms remain important in many contexts, they can constrain the speed with which information is retrieved, communicated and acted upon. Digital technologies provide alternative mechanisms through which schools can organise records, communicate with stakeholders, coordinate staff activities, monitor educational processes and support managerial decisions. Consequently, digitalisation has the potential to shift school administration from predominantly manual and reactive practices towards more connected, responsive and information-supported management systems (Fatimah et al., 2024; Wollscheid et al., 2025).



Importantly, the relationship between digital technology and school management is not merely technical but also organisational and leadership-oriented. Wollscheid et al. (2025), drawing on 350 publications in a science-mapping and content analysis, characterise digital school leadership as an emerging, interdisciplinary and still fragmented research field. Their analysis demonstrates that digitalisation creates new demands for school leaders, including competencies related to digital literacy, organisational change and the strategic integration of technologies. This suggests that the management value of digital technologies does not reside in the technology itself; rather, it emerges from the ability of school leaders to align technological possibilities with institutional goals, organisational processes and the capacities of school personnel.

This leadership dimension becomes particularly significant when digital technologies are introduced into established school routines. Adoption may require administrators and teachers to alter communication patterns, learn new systems, reorganise administrative procedures and reconsider how information is shared and decisions are made. Okunlola (2024), examining high-school leaders' experiences of digital technology adoption in Nigeria, similarly positions school leadership as central to technology integration and uses the Technology Acceptance Model to highlight the importance of perceived usefulness, ease of use and attitudes towards technological adoption. The implication is that introducing digital technologies into schools is simultaneously a technological and organisational-change process: their effectiveness depends partly on whether intended users perceive them as useful, manageable and relevant to their responsibilities.

Digital technologies can support several interconnected dimensions of secondary school management. They can facilitate record keeping, scheduling, staff coordination, communication, monitoring, reporting and access to institutional information. Recent exploratory evidence from Ghana indicates that administrators use digital technologies to improve the speed, accuracy and coordination of routine administrative functions, particularly record keeping, communication and scheduling (Adjei et al., 2025). These functions are important because management efficiency is partly determined by how quickly and accurately administrators can obtain information, coordinate organisational activities and respond to institutional demands. Digitalisation may therefore create efficiency gains by reducing repetitive manual processes and improving the accessibility of information needed for administrative action.

The communication function is particularly central to digital school management. Schools operate through continuous exchanges among administrators, teachers, students, parents and external authorities. Digital platforms can shorten communication cycles and provide multiple channels through which directives, reports, schedules, feedback and other information are exchanged. In the South West Region of Cameroon, Eponge et al. (2024) found that ICT facilitated communication and data recording and management in Catholic secondary schools, while also supporting curriculum planning, assessment and financial-management activities. Such evidence demonstrates that the administrative value of digital technologies cuts across organisational functions rather than being restricted to a single management task.

Digital technologies can also strengthen information management and evidence-informed decision-making. Administrative decisions depend on the availability, accuracy and accessibility of relevant information concerning students, staff, resources and institutional activities. When records are dispersed across paper files or disconnected administrative units, retrieving and synthesising

information can be cumbersome. Digitally organised information potentially allows administrators to access records more rapidly, identify patterns and communicate decisions efficiently. This capacity is especially relevant as school management increasingly moves towards greater accountability and evidence use. Digital school management should therefore be understood partly as an information-governance process in which technology facilitates the movement from data collection to administrative interpretation and action.

Nevertheless, digitalisation does not automatically produce efficient management. The distinction between technology availability, technology adoption and effective technology integration is critical. A school may possess computers, internet facilities or digital applications without incorporating them meaningfully into its management processes. Conversely, administrators may recognise the usefulness of digital systems but be constrained by inadequate equipment, unreliable connectivity, insufficient technical support or limited competence. Eponge et al. (2024), for instance, found that although ICT strengthened several aspects of administrative management in Catholic secondary schools in South West Cameroon, inadequate infrastructure and resources, electricity shortages, insufficient skills and training, and resistance to ICT-related policies remained important constraints.

This tension is particularly pronounced in resource-constrained educational environments. Access to digital infrastructure is often uneven across schools, and differences in socioeconomic and institutional circumstances can influence the extent to which digitalisation becomes sustainable. Evidence from South African secondary schools indicates that access to digital technologies, technological skills and continuing professional development varied substantially according to schools' socioeconomic circumstances, with less-resourced schools facing greater difficulties in preparing teachers and school managers for digitally mediated education (Ajani & Dlomo, 2025). Such inequalities imply that digital transformation may reproduce or deepen existing institutional disparities when technological reforms are not accompanied by adequate infrastructure and capacity development.

The Cameroonian context illustrates both the potential and the constraints associated with this transition. Research conducted in public secondary schools in Buea Municipality found average availability and utilisation of ICT tools for human-resource, physical-resource and financial administration (Njouny, 2021). More recent evidence from Catholic secondary schools across the South West Region indicates that ICT contributes to communication, data management, curriculum planning, assessment and financial administration, but that infrastructure, electricity, skills and training continue to affect effective implementation (Eponge et al., 2024). Considered together, these studies suggest that the discussion in Cameroon is gradually moving beyond whether schools possess ICT towards the more consequential question of how digital resources are translated into everyday administrative practice and institutional efficiency.

A further conceptual distinction is necessary between the broad phenomenon of digitalisation and the specific technologies through which it operates. Digital technologies comprise a heterogeneous set of tools whose administrative functions differ considerably. Some technologies primarily facilitate communication; others support record management, monitoring, teaching, assessment or coordination. Treating all digital technologies as a single variable may therefore conceal important differences in the pathways through which they contribute to school management. This concern is consistent with Wollscheid et al.'s (2025) observation that research on digital school leadership

remains fragmented and frequently concentrates on particular tasks or technological dimensions rather than developing a comprehensive understanding of school digital transformation.

For the present study, digital technologies in secondary school management are therefore conceptualised as electronic tools and platforms deliberately integrated into administrative and organisational processes to improve communication, coordination, information management, monitoring and the execution of school activities. Within this broad construct, the article concentrates on digital communication tools and Learning Management Systems because they represent two related but functionally distinguishable pathways through which technology may influence management efficiency. Digital communication tools primarily facilitate rapid information exchange and interaction among school stakeholders, whereas LMS provide more structured digital environments through which communication, organisation, documentation, monitoring and educational activities may be coordinated. Examining them separately makes it possible to determine more precisely how different forms of digitalisation relate to secondary school management efficiency.

This conceptualisation also guards against technological determinism. The study does not assume that introducing digital technology will inevitably improve management. Rather, it recognises that technological outcomes are mediated by infrastructure, users' competencies and attitudes, leadership practices, organisational readiness and the institutional context in which technologies are deployed. The relevant question is therefore not simply whether secondary schools possess digital technologies, but whether these technologies become embedded in management practices in ways that improve communication, coordination, monitoring and administrative responsiveness. This perspective provides the conceptual bridge to the first specific technological dimension examined in the study, digital communication tools and secondary school management efficiency.

### **2.3 Digital Communication Tools and Secondary School Management Efficiency**

Communication is central to school management because virtually every administrative function depends on the timely movement of information among individuals and institutional units. Planning requires information to be communicated and interpreted; coordination depends on interaction among staff; supervision requires feedback; decision-making relies on access to relevant information; and effective school–community relations require sustained communication with parents and other stakeholders. The increasing availability of smartphones, internet services and digital platforms has consequently altered how these communication functions are performed. Digital communication tools may be understood as internet- or electronically mediated applications that facilitate synchronous or asynchronous exchange of text, audio, images, documents and video among individuals or groups. In school settings, these include email, WhatsApp and related instant-messaging applications, videoconferencing platforms, social-media channels and other digital media used to connect administrators, teachers, students and parents (Habib et al., 2024; Okunlola, 2024).

The relevance of digital communication to management efficiency derives principally from its capacity to overcome some temporal and spatial limitations associated with conventional administrative communication. Traditional channels such as printed circulars, physical meetings, notice boards and face-to-face communication remain useful, but they may be less responsive where information must reach several stakeholders quickly or where immediate feedback is required. Digital

platforms permit administrators to circulate directives, schedules, meeting information and institutional updates simultaneously to multiple recipients, while allowing responses to be received without requiring all participants to be physically present. Okunlola (2024), in a study of 227 high-school leaders in Nigeria, found that digital technology adoption strengthened communication, virtual administration and performance monitoring and reduced spatial and temporal barriers to school leadership. WhatsApp, email, Google Forms and Zoom were among the digital media most frequently used by the school leaders.

Digital communication tools can therefore contribute to management efficiency through information sharing and administrative coordination. Administrators continuously coordinate teachers, heads of departments, discipline personnel and other school actors whose activities must be aligned with institutional schedules and objectives. Instant communication can facilitate notification of meetings, changes in timetables, deadlines, examination arrangements and other administrative requirements. In a qualitative study involving government secondary school principals in Jerusalem and the West Bank, digital communication through WhatsApp was found to support information sharing, feedback, relationship enhancement, clarification and problem-solving within school administration (Habib et al., 2024). Principals used the platform to facilitate workflow, communicate regulations and coordinate administrative activities, illustrating how relatively accessible communication technologies can become embedded in everyday organisational routines.

The relationship between digital communication and management efficiency is also evident in the speed and responsiveness of administrative interaction. Habib et al. (2024) specifically investigated email and WhatsApp in relation to communication efficiency and effectiveness among secondary school heads in Punjab Province, Pakistan. Their study demonstrates the increasing institutional relevance of these platforms to school leadership while also emphasising the need for digital-literacy development and clear guidelines governing their use. This is important because faster communication does not automatically constitute better communication. Information must remain accurate, understandable, appropriately directed and sufficiently formal where institutional accountability is required. Management efficiency therefore depends not simply on the speed provided by digital platforms but on their capacity to improve the quality, accessibility and usefulness of organisational communication.

A further administrative benefit concerns stakeholder engagement, particularly school–parent relationships. Parents require information on students' attendance, behaviour, academic progress, school activities and administrative requirements, while schools depend upon parents for feedback, cooperation and support. Digital communication can reduce the distance between school and home by creating more immediate channels for interaction. WhatsApp groups and related platforms, for example, can facilitate notifications, reminders, schedule changes and communication concerning students' progress (Habib et al., 2024). Such interaction may strengthen management efficiency where it enables administrators to communicate with parents more rapidly, address emerging concerns and mobilise stakeholder participation without depending exclusively on periodic face-to-face meetings.

Digital communication may become particularly valuable during urgent situations and institutional disruptions. School administrators sometimes need to communicate schedule changes, security information, emergency instructions or other time-sensitive messages to large groups of stakeholders. Ndung'u et al. (2024), studying social-networking sites and crisis management in public secondary

schools in Nairobi County, found substantial recognition of social-networking platforms as communication channels during crises, with WhatsApp and Facebook among the prominently used platforms. Their findings nevertheless showed differences in how parents and administrators engaged these channels, indicating that technological availability alone does not ensure consistent institutional utilisation. Digital communication therefore offers schools an additional mechanism for crisis responsiveness, but its effectiveness depends on established communication protocols and stakeholders' willingness to use the designated channels.

Within African secondary education more broadly, emerging evidence increasingly associates digital technologies with improvements in school leadership and administration. Okunola's (2024) Nigerian study found a positive influence of digital technology adoption on school leadership and management, particularly communication, virtual administration and performance monitoring. Recent research in Ghana has similarly examined the effectiveness of technology integration among senior high-school managers, reflecting the growing recognition that ICT competence and technology utilisation are becoming integral to contemporary school management (Gabriel-Wetey et al., 2025). These studies collectively shift the discussion from technology as an instructional aid towards technology as an organisational resource for leadership, coordination and administrative performance.

The Cameroonian evidence is especially pertinent to the present study. Eponge et al. (2024), using a convergent mixed-methods design in Catholic secondary schools in the South West Region, examined how ICT strengthens administrative management. Their study involved principals, accountants, teachers, students and parents and found that ICT supported school administrative functions, including communication and information management. Similarly, Fokong et al. (2024), studying teachers holding administrative responsibilities in selected secondary schools in Mfoundi Division, found a statistically significant positive effect of digital communication on students' learning outcomes and recommended strengthened capacity building in technology integration for teachers and school administrators. Although the latter study focused principally on learning outcomes rather than management efficiency, it reinforces the proposition that digital communication has implications for coordination and instructional leadership within Cameroonian secondary schools.

However, the relationship between digital communication and management efficiency should not be interpreted uncritically. Digital communication can introduce challenges concerning information overload, blurred professional boundaries, privacy, security, unequal access and informality of institutional communication. The ease with which messages can be circulated may produce excessive communication or create expectations of continuous availability among school personnel. More importantly, platforms originally developed for personal communication may not necessarily satisfy institutional requirements for confidentiality and information security. Yavaş and Gezer (2024), examining school administrators' experiences with WhatsApp, found that although the application offered important communication advantages, administrators also identified digital-security and privacy risks and emphasised the need for safer institutional communication practices. Thus, the management value of digital communication must be balanced against the need for responsible data governance, appropriate communication protocols and protection of institutional and personal information.

Access and competence constitute additional constraints. Digital communication assumes that administrators, teachers and other stakeholders possess suitable devices, adequate connectivity and



the competence necessary to use platforms effectively. Where these conditions are uneven, digital communication may exclude rather than connect particular stakeholders. Okunlola (2024), for example, found that professional-development opportunities relating to digital technologies were available only to a moderate extent for a substantial proportion of high-school leaders, leading to recommendations for more extensive and needs-responsive digital capacity development. In Cameroon, Eponge et al. (2024) similarly identified inadequate infrastructure and resources, electricity limitations, insufficient ICT skills and training, and resistance to ICT-related policies among constraints affecting technology-supported school administration. These findings demonstrate that communication efficiency is conditioned by the technological and human environment within which digital platforms operate.

The emerging literature consequently provides substantial support for the proposition that digital communication can strengthen school management, but it also reveals several limitations in the existing knowledge base. First, much of the literature examines ICT or digital technology broadly, making it difficult to isolate the contribution of communication tools to specific management outcomes. Second, some studies concentrate on instructional outcomes or general digital leadership rather than management efficiency itself. Third, while African evidence is increasing, comparatively fewer studies have investigated the relationship between specific digital communication practices and secondary school management efficiency within resource-constrained Cameroonian settings. Finally, existing studies demonstrate that technological benefits are highly contingent on connectivity, digital competence, institutional policy and leadership practices (Eponge et al., 2024; Habib et al., 2024; Okunlola, 2024).

The state of knowledge therefore suggests that digital communication tools possess considerable potential to improve secondary school management by accelerating information exchange, strengthening coordination, supporting stakeholder interaction and facilitating timely administrative responses. At the same time, their effectiveness depends on reliable connectivity, access to appropriate devices, users' digital competence, institutional communication protocols and attention to privacy and security. What remains insufficiently established, particularly within the Cameroonian secondary-school context, is the extent to which these communication advantages translate into management efficiency under the infrastructural and organisational conditions within which schools actually operate. Addressing this issue constitutes the empirical focus of the first objective of the present study.

## **2.4 Learning Management Systems and Secondary School Management Efficiency**

Learning Management Systems (LMS) have become increasingly important within the digital architecture of educational institutions. An LMS is generally understood as a digital platform that supports the organisation, delivery, monitoring and management of educational activities within a centralised environment. Contemporary systems commonly incorporate functions for content organisation, communication, assignment management, assessment, learner tracking, reporting and, increasingly, learning analytics. Although much of the literature has traditionally examined LMS from a pedagogical perspective, these functions also have substantial administrative significance because they create structured information environments through which school activities can be coordinated and monitored. Sanchez et al. (2024), for example, emphasise that contemporary LMS platforms integrate a range of course-management, communication, assessment and monitoring

functions, indicating that their organisational value extends beyond merely hosting instructional materials.

The relevance of LMS to secondary school management efficiency lies partly in their ability to centralise information and reduce fragmented administrative processes. In conventional school environments, records relating to assignments, assessments, student participation, instructional materials and communication may be dispersed across paper files, individual teachers' records or unrelated communication channels. An LMS can bring many of these activities into a single digital environment, providing administrators and teachers with more systematic access to educational information. The UNESCO Global Education Monitoring Report identifies learning management platforms as important elements of contemporary digital learning environments because they organise content and integrate digital resources within structured educational processes (Global Education Monitoring Report Team, 2023). From a management perspective, such centralisation can support consistency, accessibility and continuity in the organisation of school activities.

This centralising function also has implications for administrative coordination. Secondary school management requires the coordination of academic calendars, instructional activities, assessment processes, student progress and communication among administrators, teachers and learners. LMS can provide common digital spaces within which information concerning these activities is accessible to relevant users. Rather than depending exclusively on repeated paper notices or separate communication mechanisms, administrators and teachers can use platform-based systems to distribute information, organise activities and maintain records. In this sense, LMS adoption may reduce administrative fragmentation and facilitate greater continuity between academic and managerial processes. Msafiri et al. (2023), in their systematic review of ICT integration in secondary education, similarly found that digital platforms can support communication, collaboration, assessment, monitoring and access to educational resources, although the effectiveness of such integration depends substantially on institutional conditions and user capacity.

Another important contribution of LMS concerns monitoring and information-supported decision-making. Management efficiency requires school leaders to obtain timely information about student participation, progress, assessment and other school activities. Because LMS platforms can generate digital traces of learner engagement and performance, they potentially provide information that can support monitoring and early administrative intervention. Hase and Kuhl (2024), in a systematic review of teachers' use of data from digital learning platforms, demonstrate that such platforms can generate data that inform instructional planning and decision-making. Although their review focuses primarily on instructional use, the implications are also managerial: when information generated through digital platforms is accessible and appropriately interpreted, administrators can gain a clearer picture of participation, performance trends and areas requiring organisational attention.

The growing integration of learning analytics within LMS further strengthens this information-management potential. Palanci et al. (2024), reviewing 400 studies on learning analytics in distance education, show that digital learning environments increasingly generate and analyse data that can be used to understand participation, performance and learning processes. For secondary school management, this suggests a movement from LMS as simple repositories towards systems capable of supporting monitoring, reporting and evidence-informed action. However, the availability of data is not synonymous with effective decision-making. Administrators and teachers require the competence

to interpret platform-generated information and translate it into appropriate responses. Thus, the management value of LMS depends as much on data literacy and organisational routines as on technological capability.

LMS can also contribute to management efficiency by strengthening communication and stakeholder interaction. Many contemporary platforms incorporate announcements, messaging, discussion spaces and notification functions that allow teachers and administrators to communicate with learners and, depending on platform configuration, parents or guardians. These mechanisms can complement conventional communication channels by linking messages directly to academic activities, assessments and student progress. The organisational advantage lies in integrating communication with the processes to which that communication relates. Rather than separating instructional information from administrative interaction, an LMS can provide a more coherent digital environment within which school activities are communicated, documented and monitored. This is consistent with the broader observation that digital technology can enhance efficiency in education management through communication, collaboration and data management when technologies are appropriately aligned with institutional purposes (Global Education Monitoring Report Team, 2023).

An additional management benefit is the potential reduction of repetitive manual procedures. Digital submission of assignments, electronic recording of assessments, automated notifications, centralised access to learning resources and platform-generated reports can reduce some of the paperwork associated with conventional academic administration. Such efficiencies may allow teachers and administrators to devote more time to instructional leadership, learner support and strategic school improvement. The UNESCO report identifies efficiency as one of the more promising areas in which digital technology may contribute to education, particularly where technology reduces time spent on routine tasks and supports data management (Global Education Monitoring Report Team, 2023). LMS should therefore be viewed not simply as online classrooms, but potentially as components of a broader school-management infrastructure.

Nevertheless, the relationship between LMS adoption and management efficiency is neither automatic nor uniformly positive. One of the most persistent problems in the literature is the distinction between **adoption and meaningful use**. Schools may formally introduce an LMS while teachers and administrators use only a small proportion of its functions or continue to rely substantially on parallel manual procedures. Where this occurs, technology may add an additional layer of work rather than reduce administrative burden. Effective LMS integration therefore requires institutional routines to be redesigned so that technological processes complement or replace inefficient procedures instead of merely duplicating them. Sanchez et al. (2024) similarly show that LMS platforms vary substantially in functionality, usability and technical requirements, meaning that institutional selection and implementation decisions have important implications for their effectiveness.

Digital competence and professional development constitute another critical condition. The utilisation of LMS features for communication, monitoring, assessment and data management requires more than basic awareness of the platform. Teachers and administrators must possess sufficient confidence and competence to create content, manage activities, interpret records and troubleshoot routine difficulties. Msafiri et al. (2023) identify inadequate training, technical support and professional development among the recurring obstacles to effective ICT integration in secondary schools. This

suggests that investment in LMS without corresponding investment in human capacity may result in underutilisation and weak management returns.

Infrastructure poses an equally important constraint, particularly in low- and middle-income contexts. Most LMS platforms depend upon reliable devices, electricity and internet connectivity. Where these resources are unstable, administrators and teachers may be unable to access platforms consistently, thereby undermining the reliability needed for institutional dependence on digital systems. The Global Education Monitoring Report stresses that technological benefits are unevenly distributed and that infrastructure, equitable access, governance and teacher capacity constitute essential conditions for meaningful educational technology use (Global Education Monitoring Report Team, 2023). These constraints are especially relevant in African secondary schools, where technological availability may vary substantially among institutions and within school communities.

Questions of data protection, privacy and governance also become more significant as schools centralise information within digital platforms. LMS may contain identifiable student records, assessment information, behavioural data and communication histories. Efficient management must therefore include responsible governance of such information. The broader shift towards digital education management has generated growing concerns regarding cybersecurity, interoperability, privacy and institutional control over educational data (Global Education Monitoring Report Team, 2023). Consequently, an LMS that improves administrative accessibility but exposes sensitive information to inappropriate access cannot be regarded as unambiguously efficient. Digital efficiency must remain compatible with ethical and secure information management.

In African secondary education, scholarship specifically linking LMS adoption to school management efficiency remains comparatively limited. Much of the available literature concentrates on LMS-supported teaching, blended learning, student achievement and technology integration rather than organisational management. Msafiri et al. (2023), for example, demonstrate the value of ICT-supported platforms in secondary education but also show that the dominant research emphasis remains pedagogical. This imbalance constitutes an important knowledge gap because platforms originally introduced for teaching can simultaneously influence communication, monitoring, record management and administrative coordination. Their organisational effects therefore warrant more explicit investigation.

The Cameroonian context makes this gap particularly relevant. Digital platforms gained greater visibility during and after periods of educational disruption, but institutional capacity to use sophisticated digital systems remains uneven. The original Long Essay indicates that LMS use among the secondary schools studied was associated with improved organisation and communication of school activities, reduced dependence on manual procedures, improved planning and stronger parental involvement. Respondents nevertheless identified unreliable or unavailable internet connectivity, inadequate teacher training, limited access to technological tools and resistance to adoption as important constraints. These findings mirror the broader international literature in showing that the value of LMS is conditional upon a supportive technological and organisational environment.

The literature therefore suggests that LMS can contribute to secondary school management efficiency through centralised information organisation, improved communication, coordination of academic

activities, monitoring of participation and performance, reduction of repetitive manual processes and support for evidence-informed decision-making. However, these potential benefits are mediated by infrastructure, user competence, platform usability, institutional leadership, data-governance arrangements and the extent to which LMS becomes integrated into established management routines (Global Education Monitoring Report Team, 2023; Hase & Kuhl, 2024; Msafiri et al., 2023; Sanchez et al., 2024).

A clear state-of-knowledge gap nevertheless remains. Existing research provides considerable evidence regarding LMS as a teaching and learning environment, but substantially less evidence explains its contribution to secondary school management efficiency, particularly in African and Cameroonian contexts. Furthermore, much of the literature treats technology integration broadly without distinguishing the specific organisational contribution of LMS from other digital technologies. The present study responds to this gap by examining LMS as a management-support technology and assessing its relationship with the organisation, communication, planning and broader administrative efficiency of secondary schools. In doing so, Objective Two extends the LMS discussion beyond its conventional pedagogical orientation to consider its potential as an organisational resource within school administration.

## **2.5 Theoretical Framework**

The relationship between digital technologies and secondary school management efficiency requires a theoretical explanation that accounts for both **individual acceptance of technology and the organisational capacity to convert technological resources into improved management processes**. For this reason, the present study is anchored principally on the **Technology Acceptance Model (TAM)** developed by Davis (1989), complemented by the **Resource-Based View (RBV)** associated particularly with Barney (1991). The two perspectives are complementary rather than competing. TAM explains why school administrators and teachers may accept and use digital communication tools and Learning Management Systems, while RBV helps explain why the availability of such technologies does not necessarily generate equivalent management outcomes across schools. Together, they provide an individual–organisational explanation of technology-enabled management efficiency.

### **2.5.1 Technology Acceptance Model**

The Technology Acceptance Model was developed by Davis (1989) to explain individuals' acceptance and use of information technology. Derived from the broader tradition of reasoned-action models, TAM proposes that technology adoption is principally influenced by two beliefs: **perceived usefulness** and **perceived ease of use**. Perceived usefulness refers to the extent to which an individual believes that using a particular technology will improve his or her performance, while perceived ease of use concerns the extent to which the technology is perceived as requiring relatively little effort to operate (Davis, 1989). These perceptions influence users' attitudes and behavioural intentions and, ultimately, their willingness to use technological systems. Davis et al. (1989) subsequently demonstrated the importance of perceived usefulness and ease of use in explaining technology-use intentions and behaviour.



TAM is particularly relevant to the present study because the managerial benefits of digital technologies depend upon their **actual acceptance and utilisation by school personnel**. A digital communication platform may possess the technical capacity to accelerate information exchange, but its contribution to management efficiency will remain limited if administrators and teachers consider it difficult to use, unreliable or irrelevant to their responsibilities. Conversely, where school personnel perceive email, WhatsApp, videoconferencing and related digital communication platforms as useful for coordinating activities, disseminating information, interacting with parents and making timely administrative decisions, they are more likely to integrate these tools into routine management practices. The same reasoning applies to LMS: perceived usefulness in organising activities, monitoring students, communicating information and reducing manual procedures can encourage adoption, while perceived complexity can inhibit sustained utilisation.

The continued relevance of TAM to educational technology is supported by contemporary research. Cavus et al. (2022), in a systematic review of TAM and Learning Management Systems, demonstrated the model's extensive application to understanding LMS adoption and user acceptance. More recently, Mella-Norambuena et al. (2025) reviewed quantitative research on university teachers' intention and use of LMS and found TAM to be the most frequently employed theoretical model, appearing in 69% of the studies reviewed. Their synthesis also showed that contemporary technology-acceptance research increasingly supplements the core TAM constructs with personal, technological, social and institutional factors. This development is especially important for the present study because technology use within schools occurs within organisational environments where infrastructure, training, leadership and access can either facilitate or impede individual acceptance.

Evidence from African school leadership further supports TAM's applicability. Okunlola (2024) explicitly employed the model to examine digital technology adoption among 227 high-school leaders in Nigeria, focusing on perceived usefulness, perceived ease of use and attitudes towards technology. The study found that digital technology adoption contributed to communication, virtual administration and performance monitoring, demonstrating the usefulness of TAM for explaining technology-supported school leadership and management within an African context. Similarly, recent LMS research continues to extend TAM by incorporating factors such as self-efficacy, illustrating that users' confidence and broader enabling conditions influence acceptance alongside perceived usefulness and ease of use (Sesmiarni et al., 2024).

Applied to **digital communication tools**, TAM suggests that administrators and teachers will be more inclined to use digital platforms when they perceive them as improving communication speed, staff coordination, parent interaction, monitoring and administrative responsiveness. Ease of use is particularly significant because communication technologies are valuable to school management only when they can be incorporated conveniently into everyday activities. Complicated systems, unreliable applications or technologies requiring skills beyond those possessed by intended users may discourage sustained utilisation even where their potential benefits are recognised. Thus, the pathway implied by TAM can be expressed conceptually as **perceived usefulness and ease of use → acceptance and utilisation of digital communication tools → improved management processes**.

The same theoretical logic applies to **Learning Management Systems**, although LMS adoption may demand greater technological and organisational adjustment. School personnel are more likely to accept an LMS where they perceive that it simplifies the organisation of school activities, facilitates

communication, improves monitoring, supports planning and reduces cumbersome manual procedures. Conversely, perceptions of complexity, excessive workload or limited usefulness may produce resistance or superficial adoption. The prominence of TAM in LMS research is particularly relevant here: Mella-Norambuena et al. (2025) found that perceived usefulness and perceived ease of use remain central to explaining intention to use such platforms, even though institutional and technological conditions also need consideration.

TAM nevertheless has limitations when applied alone to the present study. Its primary explanatory emphasis is **individual technology acceptance**, whereas secondary school management efficiency is an organisational outcome. The model does not adequately explain why two schools whose personnel recognise the usefulness of digital technologies may nevertheless obtain different management benefits because one has reliable electricity, internet connectivity, devices, training and technical support while the other does not. Contemporary reviews also caution that TAM research frequently relies on self-reported intentions, concentrates more heavily on technology use than performance improvement, and may insufficiently capture structural and institutional conditions affecting adoption (Mella-Norambuena et al., 2025). These limitations justify complementing TAM with an organisational perspective.

### **2.5.2 Resource-Based View**

The Resource-Based View provides that complementary perspective. Although originally developed within strategic management, RBV offers a useful framework for understanding how organisations derive improved performance from the resources and capabilities available to them. Barney (1991) argues that organisations possess heterogeneous bundles of resources and that organisational outcomes partly depend on how strategically valuable resources are developed and deployed. Resources include not only physical assets but also capabilities, organisational processes, information and knowledge that enable an organisation to improve its efficiency and effectiveness.

Applied to educational institutions, RBV permits digital technologies to be understood as **organisational resources rather than isolated technological devices**. Computers, smartphones, communication applications, internet connectivity and LMS platforms constitute technological resources, but their management value depends upon complementary resources such as staff competence, administrators' digital leadership, technical support, reliable electricity, organisational procedures and institutional knowledge. A school may therefore possess digital infrastructure without developing the organisational capability required to use it efficiently. Conversely, relatively modest technological resources may generate substantial management benefits where they are strategically integrated with appropriate human skills and institutional routines.

This perspective is especially appropriate to resource-constrained secondary-school contexts. Differences among schools in connectivity, equipment, electricity supply, digital competence and technical support mean that technological resources are not uniformly available or equally productive. The original study itself identified poor network connectivity, inadequate access to devices, unstable electricity and differences in technological competence as barriers affecting digital communication. Similarly, LMS implementation was constrained by unreliable connectivity, inadequate training, resistance and insufficient access to technological tools. From an RBV perspective, these are not

peripheral problems; they constitute deficiencies in the complementary resource bundle required to transform technology into organisational capability.

RBV therefore extends the explanation provided by TAM. While TAM asks whether administrators and teachers **perceive a technology as useful and sufficiently easy to use**, RBV asks whether the school possesses and effectively combines the **technological, human and organisational resources** necessary to derive management value from its use. This distinction is important because willingness to adopt technology does not guarantee that the institution has the infrastructure or capabilities necessary for sustained implementation. Similarly, possessing infrastructure does not guarantee efficiency if users lack competence, motivation or confidence. Barney's (1991) emphasis on the productive deployment of organisational resources thus provides a useful bridge between technological availability and management performance.

There is, however, a limitation in transferring RBV directly from business organisations to schools. The original framework was principally concerned with organisational resources as sources of sustained competitive advantage (Barney, 1991), whereas public and private secondary schools are primarily educational and social institutions whose success cannot be reduced to competitive performance. In the present study, RBV is therefore applied selectively: not to conceptualise schools as profit-seeking firms, but to explain the more transferable proposition that **resources produce organisational benefits only when institutions possess the capabilities to deploy them productively**. Here, the outcome of interest is management efficiency rather than competitive advantage.

Taken together, TAM and RBV provide a more comprehensive explanation of the relationship examined in this study than either theory would provide independently. TAM operates principally at the **user level**, explaining how perceived usefulness and ease of use influence acceptance and utilisation of digital communication tools and LMS. RBV operates principally at the **institutional level**, explaining how technological resources must be combined with human competence, infrastructure, organisational routines and institutional support before they can generate management benefits.

The integrated theoretical logic of the study can therefore be expressed as follows:

**Digital technological resources → user perceptions and acceptance → actual integration into school management processes → management efficiency**, with **infrastructure, digital competence and institutional capacity** shaping the extent to which this pathway can operate successfully.

For digital communication tools, this means that administrators and teachers must first recognise their usefulness and be capable of using them, but schools must also possess reliable connectivity, suitable devices and organisational communication practices if faster digital interaction is to translate into improved coordination and decision-making. For LMS, perceived usefulness and ease of use influence acceptance, while infrastructure, training, technical support and institutional integration determine whether the platform develops from a technological resource into a functional management capability.

This integrated framework is particularly appropriate to the empirical context of the present study because the original evidence contains both sides of this theoretical relationship. Respondents reported management benefits from digital communication tools and LMS while simultaneously identifying connectivity, electricity, devices, competence, training and resistance as conditions constraining effective use. The study can therefore interpret management efficiency not as an automatic consequence of technological adoption but as the outcome of an interaction between **technology acceptance and institutional capability**.

Accordingly, the **Technology Acceptance Model serves as the principal theoretical lens**, while the **Resource-Based View provides a complementary organisational explanation**. This combination allows the study to move beyond the simplistic proposition that technology improves school management and towards a more defensible argument: **digital communication tools and Learning Management Systems are more likely to enhance secondary school management efficiency when users perceive them as useful and manageable and when schools possess the technological, human and organisational capabilities required to integrate them into routine management practices**.

## **2.6 State of Knowledge and Research Gap**

The literature reviewed establishes a growing consensus that digital technologies are becoming important resources for contemporary school administration. Across different educational contexts, digitalisation has been associated with faster communication, improved access to institutional information, more efficient record management, administrative coordination, stakeholder interaction and greater possibilities for evidence-informed decision-making. Recent Cameroonian evidence similarly indicates that ICT can support communication, data management and other administrative functions in secondary schools (Eponge et al., 2024), while research on digital mobile learning platforms suggests potential gains in administrative coordination and resource utilisation (Hamadou, 2025). These findings reinforce the broader proposition that digital technologies can contribute to school management efficiency when they are purposefully integrated into administrative processes.

Despite this emerging consensus, the literature remains characterised by considerable conceptual aggregation. A substantial proportion of studies examine ICT, digitalisation or educational technology as broad constructs without sufficiently distinguishing the administrative mechanisms through which particular technologies operate. For example, studies conducted in Cameroon have investigated ICT utilisation in human, physical and financial-resource administration (Njouny, 2021), ICT and administrative management more generally (Eponge et al., 2024). While this scholarship is valuable, such broad conceptualisations make it difficult to determine whether different technologies contribute to management efficiency in similar ways. Digital communication tools, for instance, operate principally through information exchange, coordination and stakeholder interaction, whereas Learning Management Systems provide more structured environments integrating communication, organisation, documentation, monitoring and educational activities. Disaggregating these technologies therefore permits a more precise understanding of their respective management contributions.

A second gap concerns the dominant orientation of existing research. Digital communication scholarship increasingly recognises the importance of communication to school management, and recent Cameroonian research confirms that effective communication remains fundamental to relationships among administrators, teachers, students and parents (Ndoh, 2025). However, comparatively less attention has been directed specifically towards whether digitally mediated communication improves measurable dimensions of management efficiency such as administrative responsiveness, coordination, reduction of time spent on routine tasks, student monitoring and timely decision-making. The gap is even more pronounced for LMS. Much of the LMS literature, including recent African scholarship, remains centred on teaching and learning, user experiences, adoption and academic engagement rather than school administration and management efficiency (Maluleke & Maake, 2025). Consequently, the administrative potential of LMS remains less developed conceptually and empirically than its pedagogical functions.

The literature further reveals an important contextual and implementation gap. Evidence consistently indicates that technological availability alone does not guarantee effective utilisation. Infrastructure, electricity, connectivity, digital competence, professional development, technical support and institutional readiness influence whether digital resources become sustainable organisational capabilities. This issue is especially relevant in African and Cameroonian school systems. Recent evidence from rural South African secondary schools, for example, demonstrates that inadequate ICT infrastructure, limited technological access and deficiencies in training and support can constrain the administrative benefits expected from digital management systems (Ajani & Dlomo, 2025). In Cameroon, recent research similarly documents the coexistence of digitalisation opportunities with infrastructural, institutional and competency-related challenges, including within Buea's secondary-school environment (Eponge et al., 2024). This suggests that the relationship between technology and management efficiency must be examined within the conditions under which school personnel actually use digital systems rather than inferred merely from their availability.

Taken together, the literature therefore reveals a specific space for the present study. Existing scholarship demonstrates the growing administrative relevance of digital technologies, but remains less conclusive about **how distinct digital technologies relate to secondary school management efficiency within resource-constrained contexts**. The present study addresses this gap by disaggregating digital technology into two functionally distinct dimensions—**digital communication tools and Learning Management Systems**—and examining each in relation to management efficiency using empirical evidence from secondary schools in Buea Municipality, South West Region of Cameroon. Its contribution is therefore not to establish simply whether schools use technology, but to determine whether technologies serving different organisational functions are associated with improvements in communication, coordination, monitoring, stakeholder interaction, organisation of activities, reduction of manual administrative processes and timely decision-making. By combining this technology-specific analysis with attention to the enabling and constraining conditions surrounding adoption, the study provides a more context-sensitive account of the relationship between **digitalisation and secondary school management efficiency**.

### **3.0 Methodology**

The study employed a **descriptive cross-sectional survey design** to examine the relationship between digital technologies and secondary school management efficiency, with particular emphasis



on digital communication tools and Learning Management Systems (LMS). This design was appropriate because data were collected from teachers and school administrators at a single point in time to describe their experiences and perceptions of technology use and to determine the relationships between the selected digital-technology dimensions and management efficiency. The original study described its design as a descriptive survey and used a structured questionnaire as the principal instrument. Since cross-sectional survey evidence does not by itself establish temporal causation, the findings are interpreted principally in terms of **relationships and influence rather than definitive causal effects**.

### **3.1 Study Area and Population**

The empirical investigation was conducted in Buea Municipality, Fako Division, South West Region of Cameroon. Buea provides a relevant setting for investigating technology-enabled school management because it contains public, confessional and lay-private secondary schools operating within an environment where digital technologies are increasingly used, but where access to reliable internet connectivity and digital devices remains uneven. The target population comprised teachers, principals and vice-principals of secondary and high schools in the municipality. The administrative records reproduced in the original study report 3,334 teachers and 110 principals/vice-principals, giving a total target population of 3,444.

For purposes of field accessibility, six secondary schools representing the different institutional categories were included in the accessible population: Bilingual Grammar School Molyko, Government Technical High School Molyko, CUIB Entrepreneurial High School, Mathlo Bilingual College Great Soppo, Baptist High School Buea, and St Theresia International Comprehensive High School. Together, these schools had an accessible population of **761 teachers and administrators**.

### **3.2 Sample and Sampling Procedures**

For the teacher survey, the study used a sample of 254 respondents drawn from the six selected secondary schools. The teacher sample size was determined from the accessible population using the Krejcie and Morgan (1970) sample-size determination framework. The reported distribution was 60 participants each from Bilingual Grammar School Molyko and Government Technical High School Molyko, 50 from CUIB Entrepreneurial High School, 40 from Mathlo Bilingual College, 30 from Baptist High School Buea, and 14 from St Theresia International Comprehensive High School. A separate administrator dataset comprised 20 principals/vice-principals and other administrators, as reflected in the administrator analyses.

The original study reports the use of stratified random and purposive sampling techniques in selecting participants and schools. Stratification was intended to ensure representation across different categories of secondary schools, while purposive considerations enabled the inclusion of respondents relevant to school management and the use of digital technologies. The analyses retained in this article therefore distinguish the teacher dataset ( $N = 254$ ) from the administrator dataset ( $N = 20$ ), rather than treating them as a single undifferentiated sample.

### **3.3 Instrumentation**

Data were collected using a **structured questionnaire containing both closed- and open-ended items**. The closed-ended items were measured on a four-point Likert-type response scale ranging from *Strongly Agree* to *Strongly Disagree*, while the open-ended items provided respondents with opportunities to elaborate on their experiences and identify practical challenges associated with technology use. The original questionnaire comprised demographic information and items corresponding to digital communication tools, internet and infrastructure access, LMS adoption and school management efficiency. For the present article, only data relating to **digital communication tools, LMS adoption and secondary school management efficiency** were extracted and analysed; items and results relating exclusively to internet and infrastructure access as an independent variable were excluded because that objective falls outside the scope of the article.

Digital communication tools were operationalised through items addressing the use and management implications of digital platforms for staff coordination, timely decision-making, reduction of communication delays, dissemination of policy information, parent–teacher collaboration and the cost and time associated with administrative communication. For example, the original instrument examined whether digital communication tools improved coordination among school staff, facilitated timely decisions and reduced delays in internal communication. The LMS dimension addressed adoption and utilisation of digital learning-management platforms in relation to the organisation and communication of school activities, planning, stakeholder interaction and reduction of manual administrative procedures. Management efficiency was assessed through indicators relating broadly to communication, coordination, monitoring, administrative responsiveness and organisation of school activities.

### **3.4 Validity and Reliability**

The questionnaire was subjected to **face and content-related scrutiny** by the research supervisor to determine whether its items adequately reflected the purpose, objectives and variables of the study. Corrections arising from this review were incorporated before the instrument was administered in the sampled schools.

Internal consistency was assessed using **Cronbach's alpha**. For the variables retained in the present article, the reported coefficients were **.726 for digital communication tools, .726 for LMS adoption and .871 for school management efficiency**. The overall questionnaire yielded an alpha coefficient of **.760**, exceeding the conventional .70 threshold adopted in the original study and indicating satisfactory internal consistency of the instrument. These coefficients support the use of the retained scales in examining the relationships addressed by the two objectives of the article.

### **3.5 Data Collection and Ethical Considerations**

Questionnaires were administered directly to teachers and administrators in their respective schools. Participants received common instructions concerning completion of the instrument, and administration was arranged at their convenience. The questionnaires were completed and returned to the researcher during the field exercise. Respondents were informed that their responses would remain anonymous and confidential and would be used for research purposes.

Ethical considerations included obtaining the relevant institutional authorisation for the study and informing participants about the research purpose. Confidentiality of information and respect for participants' views were emphasised throughout the data-collection process. No identifying information is reported in the present article, and qualitative responses are presented only where they contribute directly to interpreting the quantitative evidence.

### **3.6 Data Analysis**

Quantitative data were initially entered and processed using **EpiData 3.1**. Variables and questionnaire items were coded, and individual questionnaires were assigned serial numbers to facilitate data verification and consistency checks. The dataset was subsequently exported to **IBM SPSS Statistics version 25**, where range, consistency and data-cleaning checks were undertaken before analysis.

Descriptive statistics, principally **frequencies and percentages**, were used to summarise respondents' perceptions of digital communication tools, LMS adoption and school management efficiency. Responses on the four-point scale were also collapsed into broader agreement and disagreement categories where appropriate to facilitate interpretation. **Spearman's rank-order correlation (Spearman's rho)** was used for inferential analysis to examine the relationships between the selected digital-technology variables and management efficiency. The choice of Spearman's rho was consistent with the ordinal nature of the questionnaire responses and the analytical procedure used in the original study. The statistical decisions were made at the **.05 level of significance**.

The open-ended questionnaire responses were analysed qualitatively by identifying recurrent views concerning the benefits and constraints associated with digital communication tools and LMS adoption. These responses were used to complement and contextualise the quantitative findings rather than as an independent qualitative strand. Accordingly, the study is reported as a descriptive cross-sectional survey with supplementary qualitative evidence from open-ended questionnaire responses, rather than as a full mixed-methods design.

### **4.0 Findings**

The findings are presented according to the specific objectives retained for the article. For each objective, descriptive evidence is presented first, followed by the inferential analysis and relevant qualitative evidence from administrators. This organisation permits comparison between teachers' and administrators' assessments while preserving the empirical structure of the original study. Importantly, findings relating to internet and infrastructure access as a separate independent variable are excluded from this article.

#### **4.1 Digital Communication Tools and Secondary School Management Efficiency**

The first objective examined the relationship between the use of digital communication tools and secondary school management efficiency. Teachers' responses generally indicated favourable perceptions of the contribution of digital communication to school management.

**Table****1***Teachers' Perceptions of Digital Communication Tools and Management Efficiency (N = 254)*

| <b>Indicator</b>                                      | <b>Agree (%)</b> | <b>Disagree (%)</b> |
|-------------------------------------------------------|------------------|---------------------|
| Improved coordination among school staff              | 93.7             | 6.3                 |
| Facilitated timely decision-making                    | 88.2             | 11.8                |
| Reduced delays in internal communication              | 80.3             | 19.7                |
| Facilitated sharing of policy updates                 | 87.4             | 12.6                |
| Enhanced parent–teacher collaboration and feedback    | 76.0             | 24.0                |
| Reduced cost and time of administrative communication | 89.4             | 10.6                |
| Improved efficiency of daily school activities        | 75.6             | 24.4                |
| <b>Aggregate response</b>                             | <b>84.3</b>      | <b>15.7</b>         |

*Source: Field data.*

As shown in Table 1, **84.3%** of the aggregated teacher responses were favourable towards the contribution of digital communication tools, compared with 15.7% unfavourable responses. The strongest perception concerned improved coordination among school staff (93.7%), followed by reduced cost and time of administrative communication (89.4%) and timely decision-making (88.2%). The lowest, though still substantial, agreement concerned improvement in the efficiency of managing daily school activities (75.6%) and parent–teacher collaboration and feedback (76.0%).

Administrators expressed even stronger perceptions of the management value of digital communication tools.

**Table****2***Administrators' Perceptions of Digital Communication Tools and Management Efficiency (N = 20)*

| <b>Indicator</b>                                        | <b>Agree (%)</b> | <b>Disagree (%)</b> |
|---------------------------------------------------------|------------------|---------------------|
| Improved communication among staff                      | 100.0            | 0.0                 |
| Reduced time spent on scheduling and reporting          | 95.0             | 5.0                 |
| Improved monitoring of student performance and progress | 100.0            | 0.0                 |
| Improved collaboration with parents/guardians           | 95.0             | 5.0                 |
| Improved coordination and information sharing           | 75.0             | 25.0                |
| Facilitated faster decision-making                      | 95.0             | 5.0                 |
| <b>Aggregate response</b>                               | <b>93.3</b>      | <b>6.7</b>          |

*Source: Field data.*

The administrator results reveal particularly strong support for digital communication. All administrators (100%) agreed that digital communication tools improved communication among staff and enhanced their ability to monitor students' performance and progress. Furthermore, 95% reported

reductions in time spent on administrative activities, improved collaboration with parents and guardians, and faster decision-making. The aggregate favourable response was **93.3%**.

#### 4.1.1 Inferential Analysis

Spearman's rank-order correlation was used to determine whether the observed positive perceptions corresponded with a statistically significant relationship between digital communication tools and school management efficiency.

#### Table

3

*Relationship between Digital Communication Tools and Management Efficiency*

| Respondent group | N   | Spearman's $r_s$ | $p$    | Decision    |
|------------------|-----|------------------|--------|-------------|
| Teachers         | 254 | .511             | < .001 | Significant |
| Administrators   | 20  | .630             | < .001 | Significant |

Source: Field data. Correlations significant at the .01 level (two-tailed).

For teachers, digital communication tools were positively and significantly associated with school management efficiency ( $r_s = .511$ ,  $p < .001$ ). The relationship was stronger among administrators ( $r_s = .630$ ,  $p < .001$ ). Accordingly, the null hypothesis that digital communication tools have no significant relationship with secondary school management efficiency was rejected.

The findings are noteworthy because the two respondent groups independently point in the same direction. Teachers reported a moderately strong positive association, while administrators—whose functions place them more directly within school management processes—reported a stronger relationship. The results therefore indicate that greater utilisation of digital communication tools was associated with higher levels of reported management efficiency.

#### 4.1.2 Qualitative Evidence

The open-ended responses provide important context for interpreting this positive quantitative relationship. Administrators acknowledged the usefulness of digital communication but simultaneously identified **poor network connectivity, inadequate access to devices, limited technological competence, unstable electricity supply and difficulties using some digital tools** as constraints. Some specifically reported network failures that prevented staff from accessing information and poor internet connections that complicated communication with parents.

This evidence introduces an important qualification to the quantitative findings. Digital communication tools appear to contribute substantially to coordination, communication, monitoring and decision-making, but their management benefits are conditioned by the technological environment within which schools operate. Thus, Objective One establishes not simply that digital communication is positively related to management efficiency, but that the strength and sustainability of this contribution depend partly on connectivity, device access, electricity and users' digital competence.



**4.2 Learning Management Systems and Secondary School Management Efficiency**

The second objective retained for the article investigated the relationship between the adoption of Learning Management Systems and secondary school management efficiency. Teachers again reported predominantly favourable experiences, although the strength of agreement varied across different LMS functions.

**Table****4***Teachers' Perceptions of LMS Adoption and Management Efficiency (N = 254)*

| <b>Indicator</b>                                                   | <b>Agree (%)</b> | <b>Disagree (%)</b> |
|--------------------------------------------------------------------|------------------|---------------------|
| Improved organisation and communication of school activities       | 80.7             | 19.3                |
| Facilitated sharing of schedules, announcements and policies       | 70.5             | 29.5                |
| Provided timely administrative updates and instructions            | 74.4             | 25.6                |
| Improved monitoring of student progress and performance            | 66.9             | 33.1                |
| Reduced administrative workload related to teaching and assessment | 63.0             | 37.0                |
| Adequate training for effective LMS use                            | 64.6             | 35.4                |
| Enhanced instructional coordination                                | 79.5             | 20.5                |
| <b>Aggregate response</b>                                          | <b>71.3</b>      | <b>28.7</b>         |

*Source: Field data.*

The aggregate results show that **71.3%** of teacher responses were favourable towards LMS adoption. The strongest agreement concerned improvement in the organisation and communication of school activities (80.7%) and instructional coordination (79.5%). Approximately three-quarters (74.4%) also indicated that LMS facilitated timely administrative updates and instructions.

The relatively weaker areas are equally revealing. Agreement fell to 66.9% for efficient monitoring of student progress, 64.6% for adequate LMS training and 63.0% for reduction of administrative workload. Thus, while teachers generally perceived LMS positively, the results suggest that some of its more advanced management benefits had not been experienced uniformly.

Administrators reported stronger positive assessments.

**Table****5***Administrators' Perceptions of LMS Adoption and Management Efficiency (N = 20)*

| <b>Indicator</b>                                                    | <b>Agree (%)</b> | <b>Disagree (%)</b> |
|---------------------------------------------------------------------|------------------|---------------------|
| Streamlined administrator–teacher communication                     | 100.0            | 0.0                 |
| Improved planning and organisation of academic activities           | 90.0             | 10.0                |
| Facilitated monitoring of teacher attendance/instructional delivery | 85.0             | 15.0                |
| Limited LMS training/support constitutes a barrier                  | 90.0             | 10.0                |
| Adequate internet/devices available to support LMS                  | 75.0             | 25.0                |

| Indicator                                                | Agree (%)   | Disagree (%) |
|----------------------------------------------------------|-------------|--------------|
| Improved efficiency of record keeping and data retrieval | 95.0        | 5.0          |
| <b>Aggregate response</b>                                | <b>89.2</b> | <b>10.8</b>  |

Source: Field data.

All administrators reported that LMS had streamlined communication between administrators and teachers, while 95% perceived improved efficiency in school record keeping and data retrieval. Furthermore, 90% associated LMS with improved planning and organisation of academic activities, and 85% reported easier monitoring of teacher attendance and instructional delivery.

An important finding, however, is that **90% of administrators also regarded limited LMS training and support as a barrier to effective administrative utilisation**. This result is particularly informative: administrators recognised substantial benefits from LMS while simultaneously acknowledging deficiencies in the institutional capacity required for optimal use.

#### 4.2.1 Inferential Analysis

The relationship between LMS adoption and secondary school management efficiency was subsequently tested using Spearman's rank-order correlation.

#### Table

6

*Relationship between LMS Adoption and Management Efficiency*

| Respondent group | N   | Spearman's $r_s$ | $p$    | Decision    |
|------------------|-----|------------------|--------|-------------|
| Teachers         | 254 | .721             | < .001 | Significant |
| Administrators   | 20  | .761             | < .001 | Significant |

Source: Field data. Correlations significant at the .01 level (two-tailed).

Among teachers, LMS adoption had a strong, positive and statistically significant relationship with management efficiency ( $r_s = .721$ ,  $p < .001$ ). Among administrators, the association was similarly strong and slightly higher ( $r_s = .761$ ,  $p < .001$ ). The null hypothesis was therefore rejected.

An interesting pattern emerges when these findings are considered alongside Objective One. Although teachers' aggregate favourable perception of LMS (71.3%) was lower than their aggregate favourable perception of digital communication tools (84.3%), LMS displayed the **stronger statistical association with management efficiency** ( $r_s = .721$  compared with .511). The same pattern occurred among administrators, where LMS recorded  $r_s = .761$  compared with  $r_s = .630$  for digital communication tools. This suggests that widespread positive perception and strength of statistical association are not necessarily synonymous. LMS may be less uniformly adopted or experienced, yet where it is effectively used, its integrated functions may be more closely associated with overall management efficiency.

#### **4.2.2 Qualitative Evidence**

Administrators' open-ended responses reinforce this interpretation. Their reported experiences of LMS adoption were predominantly positive. They described LMS as making school activities easier, reducing time spent exclusively in classroom-based processes, increasing parental involvement, easing manual procedures, facilitating overall school activities and improving planning and organisation. Respondents also associated LMS with improved communication among teachers.

Taken together, the quantitative and qualitative evidence indicates that LMS is not merely perceived as an instructional platform. Its reported benefits extend to **communication, planning, organisation, monitoring, record management, stakeholder interaction and reduction of manual processes**. At the same time, training and infrastructural limitations appear to constrain the extent to which these benefits can be realised across schools.

#### **4.3 Synthesis of the Findings**

The findings provide convergent evidence across the two objectives. Both **digital communication tools and LMS were positively and significantly related to secondary school management efficiency**, and this pattern was observed independently among teachers and administrators. Digital communication tools were particularly valued for improving staff communication and coordination, accelerating information exchange, reducing administrative communication time and facilitating decision-making. LMS demonstrated broader organisational potential through communication, planning, monitoring, record keeping, data retrieval and coordination of academic activities.

More importantly, **LMS exhibited the stronger relationship with management efficiency for both respondent groups**. Among teachers, the correlations were .721 for LMS and .511 for digital communication tools; among administrators, they were .761 and .630 respectively. This comparative pattern suggests that digital communication tools and LMS may contribute to management efficiency through somewhat different mechanisms. Communication tools appear particularly useful for rapid interaction and coordination, whereas LMS may provide a more integrated organisational environment connecting communication with planning, monitoring, documentation and information retrieval.

At the same time, the findings do not support a technologically deterministic interpretation. Network instability, inadequate devices, unreliable electricity, digital competence and LMS training emerged as constraints despite the generally favourable quantitative results. The overall empirical picture is therefore one of significant digital potential operating within uneven implementation conditions.

## **5.0 Discussion of Findings**

This study examined the contribution of two dimensions of digital technology—**digital communication tools and Learning Management Systems (LMS)**—to secondary school management efficiency. The findings demonstrate that both dimensions are positively associated with management efficiency, although the nature and strength of their relationships differ. Beyond establishing these statistical relationships, the results provide insight into how digital technologies are becoming embedded in communication, coordination, planning, monitoring and information-management processes within secondary schools. The findings are discussed in relation to the empirical literature reviewed and interpreted through the **Technology Acceptance Model (TAM)** and the **Resource-Based View (RBV)**.

### **5.1 Digital Communication Tools and Secondary School Management Efficiency**

The first objective examined the relationship between digital communication tools and secondary school management efficiency. The findings indicate that greater utilisation of digital communication tools is associated with improved management efficiency. Teachers and administrators particularly associated these technologies with improved staff coordination, quicker circulation of information, timely decision-making, parent–school interaction and reductions in the time and cost involved in administrative communication. The significant positive relationships recorded for both teachers and administrators strengthen the proposition that digital communication is no longer merely supplementary to school administration but is increasingly becoming part of the organisational infrastructure through which routine management activities are undertaken.

This finding is consistent with the literature reviewed earlier, which portrays communication as a central component of effective school administration. **Eponge et al. (2024)** found that ICT utilisation could improve communication, information management and administrative functioning in Cameroonian secondary schools. Similarly, **Ndoh (2025)** emphasised the importance of effective communication in strengthening interactions among school administrators, teachers, students and parents. Viewed alongside the present findings, digital communication tools appear to extend this traditional management function by increasing the speed, reach and flexibility with which information can circulate among stakeholders. Their value therefore resides not simply in replacing face-to-face or paper-based communication, but in reducing some of the spatial and temporal limitations associated with conventional administrative communication.

The results also reinforce the argument advanced by **Njouny (2021)** that ICT resources can support different dimensions of school administration when appropriately integrated into organisational processes. The present study extends this position by isolating digital communication tools from the broader category of ICT. Such disaggregation is important because it demonstrates more specifically how communication technologies contribute to management efficiency. Messaging applications, email and other digital platforms enable administrators to communicate instructions, circulate schedules and policy information, coordinate staff activities and maintain interaction with parents without necessarily requiring stakeholders to be physically present at school. In this respect, digital communication can shorten administrative response time and facilitate more continuous organisational coordination.

The finding that administrators perceived particularly strong management benefits is also understandable from an organisational perspective. School administrators occupy positions that require frequent interaction with teachers, students, parents and other stakeholders. Technologies that facilitate rapid information transmission and feedback can therefore have immediate implications for their work. The positive administrator responses concerning scheduling, reporting, student monitoring and decision-making suggest that digital communication is increasingly connected to the execution of core management responsibilities rather than communication alone. This supports the broader literature reviewed in Section 2.3, where digitalisation was conceptualised as capable of facilitating coordination and administrative responsiveness rather than merely providing additional communication channels.

Nevertheless, the qualitative evidence introduces an important qualification. Administrators identified unstable internet connectivity, inadequate access to devices, unreliable electricity, limited digital competence and difficulties in using some applications as barriers to effective digital communication. These findings correspond with the implementation challenges identified in African educational settings. **Ajani and Dlomo (2025)** similarly observed that inadequate ICT infrastructure, restricted technological access and insufficient training and support can limit the effective utilisation of digital systems in secondary schools. The implication is that the existence of digital communication platforms does not automatically translate into efficient management. Their contribution depends upon the institutional and human conditions that enable administrators and teachers to use them consistently and effectively.

The finding can be interpreted particularly well through the **Technology Acceptance Model (TAM)**. Davis's (1989) model proposes that technology adoption is substantially influenced by users' perceptions of its **usefulness** and **ease of use**. The strong positive evaluations of digital communication tools suggest that teachers and administrators perceive these technologies as useful because they facilitate coordination, information exchange, decision-making and stakeholder communication. Such observable administrative benefits are likely to strengthen willingness to adopt and continue using the technologies. Conversely, difficulties arising from poor connectivity, inadequate devices and limited user competence may reduce perceived ease of use and consequently constrain sustained utilisation. From a TAM perspective, therefore, management efficiency depends not only on the availability of digital communication technologies but also on whether users perceive them as sufficiently useful, accessible and manageable within their working environment.

The findings are equally meaningful from the perspective of the **Resource-Based View (RBV)**. RBV conceptualises organisational resources as potential sources of enhanced performance when they are effectively acquired, organised and deployed (Barney, 1991). Applied to secondary schools, digital communication tools constitute technological resources, but their value emerges from the manner in which they are combined with complementary organisational resources such as staff competence, leadership support, connectivity and appropriate administrative routines. The findings therefore suggest that simply possessing communication technologies is insufficient. Schools are more likely to realise management benefits when digital tools become embedded within established processes of coordination, reporting, information sharing and stakeholder engagement. Digital communication competence can consequently be understood as an **organisational capability**, rather than merely the possession of technological devices.



**5.2 Learning Management Systems and Secondary School Management Efficiency**

The second objective investigated the relationship between LMS adoption and secondary school management efficiency. The findings demonstrate a strong positive relationship between LMS adoption and management efficiency among both teachers and administrators. Respondents associated LMS with improved organisation and communication of school activities, dissemination of schedules and announcements, monitoring of student progress, instructional coordination, planning, record keeping and retrieval of information. These results broaden the conventional understanding of LMS beyond its pedagogical function by demonstrating its potential as an instrument of school organisation and administration.

This finding is particularly important when situated within the literature reviewed in Section 2.4. Much of the existing LMS scholarship has concentrated on teaching, learning, learner engagement and course delivery. As noted in the state-of-knowledge review, even recent African LMS research, including **Maluleke and Maake (2025)**, remains strongly concerned with adoption, educational experiences and pedagogical utilisation. The present findings suggest that this orientation captures only part of the organisational value of LMS. When LMS platforms are incorporated into school processes, their functions may extend beyond supporting classroom instruction to coordinating academic activities, circulating information, monitoring performance, storing records and connecting administrators with teachers and other stakeholders.

The findings also resonate with **Hamadou (2025)**, whose work on digital mobile learning platforms points to the potential of digital systems to strengthen administrative coordination and resource utilisation. The current study provides additional empirical support for this proposition by showing that respondents perceive LMS as useful for activities that connect instructional processes with administrative responsibilities. This is significant because secondary school management requires continuous coordination between the pedagogical and administrative domains. A system capable of bringing schedules, communication, monitoring, instructional activities and records into a more integrated environment can potentially reduce fragmentation in school management.

Of particular significance is the comparatively stronger relationship between LMS and management efficiency than between digital communication tools and management efficiency. This pattern occurred among both respondent groups. Rather than suggesting that communication tools are unimportant, the difference may reflect the **integrative character of LMS**. Digital communication applications principally facilitate information exchange and interaction, whereas LMS can combine communication with documentation, planning, monitoring, assessment, record management and information retrieval within a common digital environment. Consequently, where an LMS is effectively adopted, its influence may extend across several interconnected administrative processes simultaneously.

The descriptive and qualitative findings, however, indicate that the potential of LMS has not been uniformly realised. Teachers' responses concerning adequate training and reductions in administrative workload were comparatively less favourable, while administrators overwhelmingly acknowledged limited LMS training and support as a barrier. This finding reinforces the implementation gap identified in the literature. **Ajani and Dlomo (2025)** demonstrate that digital systems cannot achieve their intended organisational benefits where infrastructure, technical support and user preparation

remain inadequate. Similarly, the Cameroonian evidence reviewed through **Eponge et al. (2024)** points to the importance of institutional and competency-related conditions in translating technological availability into meaningful educational and administrative outcomes.

TAM provides a useful explanation for this apparent tension between strong potential and uneven utilisation. LMS platforms may be perceived as highly useful because they facilitate several school functions simultaneously; however, their relative complexity may make **perceived ease of use** more consequential than it is for simpler communication applications. Training, familiarity, technical assistance and reliable access therefore become central to adoption. The finding that administrators recognised both substantial LMS benefits and inadequate training illustrates this dynamic particularly clearly. Users may appreciate the usefulness of a technological system while encountering practical difficulties that prevent them from exploiting its full capabilities. From the TAM perspective, sustained LMS adoption consequently requires schools to address both dimensions: users must recognise the administrative value of the system and possess the knowledge and enabling conditions necessary to use it effectively.

The RBV offers a complementary organisational interpretation. An LMS constitutes a potentially valuable digital resource, but its management contribution depends upon the school's capacity to integrate it with other resources and routines. Infrastructure, internet connectivity, devices, digital competence, technical support and managerial commitment constitute complementary resources without which the technological platform itself may remain underutilised. In RBV terms, therefore, the critical resource is not simply the LMS platform but the **school's capability to deploy and integrate the LMS into its administrative and instructional processes**. This interpretation explains why schools may possess similar technological platforms yet derive markedly different organisational benefits from them.

The qualitative accounts reinforce this interpretation. Administrators associated LMS with reduced manual processes, easier management of school activities, improved planning and organisation and enhanced communication. These experiences suggest that LMS can generate efficiency partly by restructuring administrative routines rather than merely digitising existing ones. Where information can be entered, stored, retrieved, communicated and monitored through an integrated system, some repetitive manual procedures may be reduced. The potential contribution of LMS therefore lies not simply in technological substitution but in facilitating a more coordinated approach to managing information and academic activities.

Considered together, the two sets of findings demonstrate that **digital communication tools and LMS represent related but functionally distinct pathways through which digitalisation can contribute to secondary school management efficiency**. Digital communication tools appear particularly important for immediacy: they facilitate rapid information exchange, staff coordination, stakeholder interaction and administrative responsiveness. LMS, by contrast, appears to offer a more integrated organisational architecture by connecting communication with planning, monitoring, documentation, record management and instructional coordination.

The findings consequently support the complementary explanatory value of **TAM and RBV**. TAM explains the phenomenon principally from the **user-adoption perspective**: digital technologies are more likely to become embedded in school management when teachers and administrators perceive

them as useful and sufficiently easy to use. RBV shifts attention to the **organisational capability perspective**: technologies contribute to efficiency when schools possess and coordinate the complementary human, infrastructural and managerial resources required to transform digital tools into productive organisational capabilities. Taken together, the theories suggest that effective digitalisation requires both **individual acceptance and institutional capacity**.

This synthesis also cautions against interpreting school digitalisation simply in terms of acquiring technologies. The empirical evidence indicates that technologies can coexist with connectivity difficulties, inadequate devices, unstable electricity and deficiencies in training and technical support. Consequently, **technology availability, technology adoption and technology-enabled management capability are analytically different conditions**. A school may possess a digital platform without widespread adoption, and it may achieve adoption without developing the institutional capability required to exploit the platform fully.

The principal contribution emerging from the study is therefore that secondary school digitalisation should be understood as an **organisational transformation process rather than merely a technology-acquisition exercise**. Digital communication tools strengthen the communicative and coordinative architecture of school administration, while LMS potentially provides a more integrated environment for organising administrative and instructional processes. However, the management value of both depends on the interaction between technological resources, user acceptance, digital competence and institutional support. In the Cameroonian secondary-school context represented by the empirical setting of this study, strengthening these complementary conditions may therefore be as important as expanding access to the technologies themselves.

## **6.0 Conclusion and Implications**

### **6.1 Conclusion**

The increasing digitalisation of education is transforming not only teaching and learning but also the processes through which secondary schools are organised and managed. This study examined this transformation through two specific technological dimensions—**digital communication tools and Learning Management Systems (LMS)**—and their relationship with secondary school management efficiency. By separating these technologies rather than treating digitalisation as a single undifferentiated construct, the study provides a more nuanced understanding of the pathways through which digital technologies can support school administration.

The findings demonstrate that both digital communication tools and LMS are positively and significantly associated with secondary school management efficiency. Digital communication tools primarily strengthen the **communicative and coordinative dimensions** of management by facilitating staff interaction, information sharing, parent–school collaboration, monitoring and timely administrative decision-making. LMS, while incorporating communication functions, appears to offer a broader organisational contribution through the integration of planning, coordination, monitoring, record management, information retrieval and instructional activities. The comparatively stronger association between LMS adoption and management efficiency suggests that integrated digital platforms may possess considerable organisational value when effectively embedded in school management processes.

However, the findings also demonstrate that technological adoption alone is insufficient to guarantee management efficiency. Connectivity difficulties, unreliable electricity, inadequate access to appropriate devices, limited digital competence and insufficient LMS training and technical support constrain the extent to which schools can realise the potential benefits of digitalisation. This reinforces evidence from Cameroon and other African contexts that the effectiveness of educational technologies is conditioned by infrastructure, human capacity and institutional support (Ajani & Dlomo, 2025; Eponge et al., 2024; Okunlola, 2024). Digital transformation should therefore not be equated with the mere acquisition of technological tools; rather, it involves developing the organisational capacity to incorporate those technologies sustainably into everyday management practice.

The combined application of the **Technology Acceptance Model and Resource-Based View** provides an important explanation for this conclusion. TAM demonstrates that technological integration depends partly on whether administrators and teachers perceive digital systems as useful and sufficiently easy to use (Davis, 1989), while RBV demonstrates that technological resources generate organisational benefits only when combined effectively with complementary human, infrastructural and organisational capabilities (Barney, 1991). The study therefore concludes that **secondary school management efficiency is most likely to benefit from digitalisation where technological availability is accompanied by user acceptance, digital competence, reliable infrastructure and purposeful institutional integration.**

Although the evidence was generated from secondary schools in Buea Municipality and should not be generalised uncritically to all secondary schools in Cameroon, the study contributes to the broader discourse on digital school administration in resource-constrained educational environments. Its principal contribution lies in shifting attention from the question of whether schools possess digital technologies towards the more consequential question of **how particular technologies become organisational capabilities capable of improving school management.**

## **6.2 Implications for School Management Practice**

The findings have important implications for secondary school administrators. First, school leaders should approach digital technologies as **management resources rather than supplementary communication conveniences.** Digital communication platforms should be incorporated deliberately into administrative procedures for staff coordination, information dissemination, parent engagement, monitoring and feedback. Clear institutional protocols are nevertheless necessary to determine appropriate platforms, communication responsibilities, information-security expectations and the types of administrative information that should be transmitted digitally. Such organisation is particularly important because research has identified privacy, security and professional-boundary concerns associated with informal digital communication platforms (Yavaş & Gezer, 2024).

Second, schools should move towards more purposeful integration of LMS into both **instructional and administrative processes.** The findings suggest that the management potential of LMS extends beyond uploading learning materials. School leaders can exploit such systems for coordinating academic activities, communicating schedules, monitoring instructional processes, maintaining accessible records and facilitating information retrieval. This requires moving from nominal LMS

adoption towards institutional integration, where platform functions become embedded within routine school-management procedures.

Third, **continuous professional development** should accompany technological adoption. Administrators and teachers require more than basic familiarity with digital applications; they need practical competence in using technologies for administrative communication, information management, monitoring and decision-making. The importance of professional development and technological competence identified in previous studies (Msafiri et al., 2023; Okunlola, 2024) is reinforced by the present finding that limited LMS training remained a substantial constraint even where administrators recognised the platform's usefulness. Training should therefore be continuous, practical and aligned with the actual management functions expected of users.

Finally, school leaders should recognise that digital transformation involves **organisational change**. Introducing new platforms without reviewing existing administrative routines may result in duplication, where personnel maintain paper-based procedures while simultaneously performing equivalent digital tasks. Schools should therefore identify processes that can appropriately be streamlined, integrated or redesigned through technology. The objective should not be digitalisation for its own sake, but the creation of simpler, more responsive and better-coordinated management processes.

### **6.3 Policy Implications**

At the policy level, the findings suggest that efforts to digitalise secondary education should adopt a more integrated approach. Investment in computers, internet services and digital platforms is necessary but insufficient. Effective digitalisation requires simultaneous attention to **infrastructure, electricity, connectivity, user competence, technical support and institutional implementation capacity**. This corresponds with broader evidence showing that infrastructure, equitable access, governance and human capacity determine whether educational technology generates meaningful benefits (Global Education Monitoring Report Team, 2023; Msafiri et al., 2023).

For Cameroon, this implies that policies aimed at strengthening digital education should explicitly incorporate **school administration and management**, rather than concentrating predominantly on technology-supported teaching and learning. Digital transformation strategies should recognise administrators as critical actors who require appropriate technological competencies to lead digitally enabled institutions. Capacity-development programmes for principals, vice-principals and other school managers should consequently include digital communication management, LMS administration, data use, information security and technology-supported decision-making.

There is also a need to address inequalities in schools' digital readiness. A uniform expectation that all secondary schools adopt sophisticated digital management systems may produce uneven outcomes where institutions differ substantially in connectivity, electricity supply, technological equipment and staff competence. Policy implementation should therefore be responsive to school contexts, with greater infrastructural and technical support directed towards institutions facing the most significant digital constraints. Such an approach would help prevent digitalisation from reinforcing existing inequalities between better-resourced and less-resourced schools.



Furthermore, educational authorities should encourage the development of **clear standards for digital school management**, particularly concerning data protection, institutional communication and the responsible use of third-party platforms. As schools increasingly store, exchange and process student and staff information digitally, efficiency must be accompanied by appropriate safeguards for confidentiality, privacy and information security. Digital governance should therefore become an integral component of school-governance policy rather than an afterthought to technological expansion.

#### **6.4 Implications for Future Research**

The findings also open several directions for further investigation. Since the study employed a cross-sectional design, it establishes significant relationships but cannot demonstrate how management efficiency changes over time as schools progressively adopt digital technologies. Future research could therefore employ **longitudinal designs** to examine whether sustained use of communication technologies and LMS produces enduring improvements in administrative processes.

The geographical scope should also be extended. Because the empirical evidence was generated from schools in Buea Municipality, comparative studies across other municipalities, regions and linguistic or socioeconomic contexts in Cameroon would help determine whether similar relationships occur under different institutional conditions. Comparative research involving public, confessional and lay-private schools could further investigate whether differences in resources, governance arrangements and digital readiness influence the management returns associated with technology adoption.

Future studies could also investigate the mechanisms underlying the relationships identified here. In particular, **digital competence, leadership support, technological infrastructure and institutional readiness** could be examined as mediating or moderating variables between digital technology adoption and management efficiency. Such research would advance the argument developed through TAM and RBV by empirically determining not simply whether technology relates to efficiency, but **under what conditions and through what organisational mechanisms** those relationships become stronger or weaker.

Finally, further research should investigate LMS explicitly as a **school-management technology**, rather than predominantly as an instructional platform. The present findings indicate that its administrative functions may encompass planning, monitoring, communication, record management and information retrieval, yet these dimensions remain comparatively underexplored in secondary-school research. Qualitative case studies and mixed-methods investigations could provide deeper insight into how administrators actually incorporate LMS into daily management routines and why some schools derive greater organisational value from these platforms than others.

#### **6.5 Concluding Contribution**

Taken together, the study advances a simple but important proposition: **the management value of digital technology lies not in its presence, but in its productive institutional use**. Digital communication tools can make secondary school administration more connected and responsive, while LMS can provide a more integrated organisational environment for communication, planning, monitoring and information management. Yet neither technology becomes an organisational

capability automatically. Its contribution depends upon the people who use it, the infrastructure that supports it and the institutional arrangements through which it becomes embedded in school practice.

The study therefore moves the discussion from **digital access to digital capability**. For secondary schools operating in resource-constrained contexts, this distinction is particularly important. Sustainable improvements in management efficiency require schools and educational authorities to invest simultaneously in technological resources, human competence and institutional capacity. It is at the intersection of these three conditions—not technology acquisition alone—that the transformative potential of digital school management is most likely to be realised.

## References

- Adjei, A., Kagbetor, E. K., Damengua, G., & Zaglago, L. (2025). Digital technology in school administration: An exploratory study from Ghana's Kpone-Katamanso Municipal District. *Canadian Journal of Educational and Social Studies*, 5(6), 83–109. <https://doi.org/10.53103/cjess.v5i6.426>
- Ajani, O. A., & Dlomo, S. (2025). Enhancing school administration in rural South African schools: Challenges and opportunities—Using the scoping review method. *Research in Social Sciences and Technology*, 10(1), 332–354. <https://doi.org/10.46303/ressat.2025.18>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Cavus, N., Omonayajo, B., & Mutizwa, M. R. (2022). Technology Acceptance Model and Learning Management Systems: Systematic literature review. *International Journal of Interactive Mobile Technologies*, 16(23), 109–124. <https://doi.org/10.3991/ijim.v16i23.36223>
- 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>
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982–1003. <https://doi.org/10.1287/mnsc.35.8.982>
- Eponge, O. A., Nduku, E., & Koros, P. (2024). ICTs' role in strengthening administrative management in Catholic secondary schools of South West Cameroon. *Journal of Education*, 7(3), 1–19. <https://doi.org/10.53819/81018102t4295>
- Fatimah, M., Sugiyarti, S., & Ahmada, F. A. A. (2024). Transformasi administrasi tatalaksana sekolah di era digital: Tantangan dan peluang untuk pendidikan masa depan [Transformation of school administration in the digital era: Challenges and opportunities for the future of education]. *TSAQOFAH*, 4(6), 3973–3984. <https://doi.org/10.58578/tsaqofah.v4i6.3924>
- Fokong, N. H., Tendong, C. E., & Ambengwa, B. S. (2024). Effects of teachers' digital leadership on students' learning outcomes in selected secondary schools in Mfoundi Division-Cameroon. *American Journal of Education and Practice*, 8(5), 79–96. <https://doi.org/10.47672/ajep.2527>
- Gabriel-Wetley, F. K. N., Mintah, J. A., Asomah, R. K., & Abonyi, U. K. (2025). Effectiveness of school managers' technology integration in senior high school management in Ghana. *Journal*

*of Education for Sustainable Innovation*, 3(2), 110–126.  
<https://doi.org/10.56916/jesi.v3i2.1276>

Global Education Monitoring Report Team. (2023). Global education monitoring report 2023: Technology in education—A tool on whose terms? UNESCO.  
<https://doi.org/10.54676/UZQV8501>

Habib, M., Qamar, M. R., Amjad, A. I., Amin, M., Tabassum, U., Hayyat, U., & Rafique, U. (2024). Digital communication in school leadership: Examining email and WhatsApp use, challenges, and efficiency in Punjab Province. *Journal of Social Sciences Advancement*, 5(4), 9–18.  
<https://doi.org/10.52223/JSSA24-050402-98>

Hamadou, Y.-K. (2025). Evaluating the impact of digital mobile e-learning on school management efficiency: A cross-efficiency DEA and bootstrapped regression analysis. *Journal of Economic and Social Thought*, 12(2), 86–104.

Hase, A., & Kuhl, P. (2024). Teachers' use of data from digital learning platforms for instructional design: A systematic review. *Educational Technology Research and Development*, 72, 1925–1945. <https://doi.org/10.1007/s11423-024-10356-y>

Kombo, L., & Mwila, P. M. (2024). Role of information and communication technologies in improving school administration in secondary schools: A case of Ilala Municipality. *International Journal of Scientific Research and Modern Technology*, 3(12), 13–18.  
<https://doi.org/10.5281/zenodo.14554540>

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.  
<https://doi.org/10.1177/001316447003000308>

Liu, T., Luo, Y. T., Pang, P. C.-I., & Kan, H. Y. (2025). Exploring the impact of information and communication technology on educational administration: A systematic scoping review. *Education Sciences*, 15(9), Article 1114. <https://doi.org/10.3390/educsci15091114>

Maluleke, A. F., & Maake, G. (2025). Examining the impact of Learning Management Systems in African higher education: A systematic review. *African Journal of Inter/Multidisciplinary Studies*, 7(1), 1–15. <https://doi.org/10.51415/ajims.v7i1.1550>

Mella-Norambuena, J., Chiappe, A., & Badilla-Quintana, M. G. (2025). Theoretical and empirical models underlying the teaching use of LMS platforms in higher education: A systematic review. *Journal of Computers in Education*, 12, 997–1023. <https://doi.org/10.1007/s40692-024-00336-9>

Msafiri, M. M., Kangwa, D., & Cai, L. (2023). A systematic literature review of ICT integration in secondary education: What works, what does not, and what next? *Discover Education*, 2, Article 44. <https://doi.org/10.1007/s44217-023-00070-x>

Msambwa, M. M., & Daniel, K. (2024). A systematic literature review on the ICT integration in teaching and learning: Lessons for an effective integration in Tanzania. *European Journal of Education*, 59(4), Article e12696. <https://doi.org/10.1111/ejed.12696>

Ndoh, K. M. (2025). An assessment of effective communication in school management in secondary schools in the Northwest and South-West Regions of Cameroon. *International Journal of*

*Science and Research Archive*, 15(1), 1169–1179.  
<https://doi.org/10.30574/ijsra.2025.15.1.1108>

Ndung'u, M. M., Kitur, J., & Mbogo, R. (2024). An investigation on the extent of utilisation of social networking sites in crisis management of public secondary schools in Nairobi County, Westlands Sub-County. *Journal of Education Management and Leadership*, 3(1), 1–25.  
<https://doi.org/10.51317/jeml.v3i1.472>

Njouny, M. E. (2021). Evaluating the use of ICTs in secondary school administration in Cameroon: The case of some secondary schools in the Buea Municipality. *GPH-International Journal of Educational Research*, 4(2), 62–75.

Okunlola, J. O. (2024). Digital technology adoption and school leadership in the post-pandemic era: Insights from high school leaders. *Interdisciplinary Journal of Education Research*, 6, 1–14.  
<https://doi.org/10.38140/ijer-2024.vol6.32>

Palanci, A., Yilmaz, R. M., & Turan, Z. (2024). Learning analytics in distance education: A systematic review study. *Education and Information Technologies*, 29, 22629–22650.  
<https://doi.org/10.1007/s10639-024-12737-5>

Sanchez, L., Penarreta, J., & Soria Poma, X. (2024). Learning management systems for higher education: A brief comparison. *Discover Education*, 3, Article 58.  
<https://doi.org/10.1007/s44217-024-00143-5>

Sesmiarni, Z., Hoque, M. E., Susanto, P., Islam, M. A., & Hendrayati, H. (2024). Adoption of SPACE-learning management system in education era 4.0: An extended technology acceptance model with self-efficacy. *Frontiers in Education*, 9, Article 1457188.  
<https://doi.org/10.3389/feduc.2024.1457188>

Wollscheid, S., Tømte, C. E., Egeberg, G. C., Karlstrøm, H., & Fossum, L. W. (2025). Research trends on digital school leadership over time: Science mapping and content analysis. *Education and Information Technologies*, 30, 747–778. <https://doi.org/10.1007/s10639-024-12909-3>

Yavaş, T., & Gezer, M. (2024). Digital security and WhatsApp usage at school according to school administrators: A qualitative research. *SHS Web of Conferences*, 206, Article 01022.  
<https://doi.org/10.1051/shsconf/202420601022>