



Accelerating Digital-Based Education Management to Improve the Effectiveness of School Services

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Abstract

The digital transformation of schools should not be viewed merely as the replacement of manual services with applications. This transformation requires managerial skills to streamline processes, establish data discipline, enhance the digital literacy of the school community, and ensure that services are fast, accurate, transparent, and easily accessible. This study aims to analyze the acceleration of digital-based educational management in improving the effectiveness of school services. The study employs a qualitative approach with a field case study design at one secondary school that has implemented digital academic and administrative services. Data were collected through semi-structured interviews, service observations, and documentation. There were 18 informants, consisting of the principal, vice principal, school operator, administrative staff, teachers, students, parents, and the school committee. Informants were selected through purposive sampling based on their direct involvement in the planning, implementation, use, and evaluation of the school's digital services. Data were analyzed through data reduction, coding, categorization, theme extraction, and triangulation of sources and techniques. The research results indicate that the acceleration of digital-based educational management occurs through five main mechanisms: digital leadership commitment, service data integration, workflow simplification, the establishment of support channels, and user-feedback-based evaluation. The effectiveness of school services improved in terms of information access speed, data accuracy, document traceability, communication transparency, and administrative service responsiveness. Major obstacles include disparities in digital literacy, reliance on operators, network disruptions, and inconsistent adherence to digital service procedures. This study proposes a model for accelerating digital school services that integrates leadership, data, standard operating procedures (SOP), digital literacy, and feedback into a unified service management framework.

Keywords: digital education management, school service effectiveness, digital leadership, school administrative services, digital transformation

Introduction

Schools today operate in an increasingly fast-paced, open, and data-driven environment. Parents need academic information immediately. Teachers need systems that simplify learning reporting. Students need access to schedules, grades, attendance records, and school communications without cumbersome

processes. Administrative staff are also required to work with greater accuracy, as data errors can directly impact student services.

Digital-based educational management has become essential because school services no longer rely solely on administrative counters and paper documents. School information systems, electronic report cards, digital attendance tracking, electronic archives, online communication channels, and digital forms have become part of the school environment. However, these changes do not automatically improve service quality. Technology only delivers benefits when schools are able to streamline processes, assign roles, safeguard data, and foster a consistent culture of service.

Hanelt et al. (2021) explain that digital transformation should be understood as a strategic organizational change, not merely the adoption of technology. This perspective is relevant to schools because the digitization of services requires changes in work structures, communication patterns, and decision-making processes. Schools that simply purchase applications without improving their service workflows risk creating redundant work. Digital data can remain disorganized if its management is unclear.

Konopik et al. (2022) emphasize that organizations need to master digital capabilities so that transformation does not stop at technology projects. In the school context, digital capabilities are evident in the principal's ability to identify service needs, the ability of teachers and administrative staff to use the system, and the school's willingness to streamline outdated procedures. These capabilities form the foundation for acceleration because changes in school services are driven by people, not by applications alone.

Timotheou et al. (2023) demonstrate that digital technology has an impact on education when schools possess digital capacity, infrastructure support, user competencies, and clear policy direction. These findings indicate that school digital services must be managed as an ecosystem. Academic, administrative, communication, and reporting applications should not operate in isolation. Each system must be aligned with the actual needs of the school community.

Karakose et al. (2021) identify school principals' digital leadership as a key element in fostering a culture of digital learning. It is not enough for principals to simply provide instructions on how to use applications. Principals need to serve as visionaries, providers of support, liaisons between departments, and overseers of service quality. In school services, digital leadership is evident in the ability to set service priorities, resolve user issues, and maintain data integrity.

Jameson et al. (2022) state that research on digital leadership has evolved from the use of technology toward organizational maturity in leading change. This idea helps explain why some schools already have digital devices but their services are not yet effective. The problem lies not only in the technology. Issues also exist in coordination, division of labor, data security, and the ability to identify user needs.

Sanoto et al. (2025) found that the digitization of school management can improve access to information, service efficiency, and the accuracy of program evaluations. These findings serve as an important foundation for this study.

However, research on digital school services still needs to clarify how the acceleration process occurs in practice. The key question is not merely whether digitization is beneficial, but how schools can accelerate those benefits in a targeted and sustainable manner.

McCarthy et al. (2023) emphasize that the digital transformation of education requires leadership, a systemic vision, infrastructure, and changes in practice. At the school level, these components can be translated into simple service design, clear data flows, and user support mechanisms. Without these, digitization can easily become a new burden for teachers, students, and parents.

Mukul and Buyukozkan (2023), in their systematic review of Education 4.0, demonstrate that the digital transformation of education is linked to the integration of technology, adaptive capabilities, and the use of data. This perspective provides a theoretical basis for viewing school services as part of management reform. Effective services are not merely fast; they must also be accurate, easy to follow, monitorable, and provide a better user experience.

A major issue facing many schools is the imbalance between the use of applications and the readiness of service management. Schools may already be using digital attendance systems, e-report cards, learning platforms, and communication groups. However, data remains scattered, teachers are still filling out duplicate forms, parents are still asking questions through multiple channels, and school administrators are bearing the brunt of the administrative burden. This situation indicates that digital acceleration has not always been accompanied by effective service organization.

In light of these issues, this study focuses on the acceleration of digital-based educational management in improving the effectiveness of school services. The research focuses on managerial processes rather than on the technical evaluation of applications. This study examines how schools plan digital services, mobilize resources, assign roles, overcome obstacles, and assess the impact of these services on users.

The research questions in this study are formulated around three main areas of focus. First, how is the process of accelerating digital-based educational management implemented in schools? Second, how does this acceleration improve the effectiveness of school services? Third, what factors support and hinder the sustainability of school digital services? These three questions are used to link the dimensions of management, technology, and user experience.

The contribution of this study lies in the development of an empirical model for digital school services based on field data. This study goes beyond a mere description of technology. It establishes the relationships between digital leadership, data governance, user literacy, service SOP, support channels, and feedback evaluation. This model is expected to help schools accelerate their digital services without neglecting the principles of order, accountability, and ease of access.

Table 1. Map of School Service Issues Before and After Digitization

Service Aspects	Manual Conditions	Expected Digital Conditions	Risks if not managed
Academic administration	Grades, attendance, and schedule data are stored in separate files	Data is presented in a system that is easy to track	Duplicate entries and data discrepancies between units
School communication	disseminates information via letters and unstructured messages	Official information is disseminated through via agreed-upon channels	Information is overlapping and difficult for to verify
Parent services	Parents must come in person to request specific data	Parents can quickly access basic information	Complaints are increasing due to unequal access
School documentation	Physical records are easily misplaced and time-consuming to locate	Digital documents are neatly stored and have an access trail	Risks of data loss and privacy breaches
Program evaluation	Decisions are increasingly based on final reports	Decisions are supported by more up-to-date service data	Decisions are delayed because data is not ready

Table 1 shows that the digitization of school services serves not only as a technical change but also as an effort to improve service management to make it more organized, efficient, and accurate. Under manual conditions, academic administrative services, school communications, parent services, documentation, and program evaluations remain scattered across numerous files, messages, or reports that are difficult to track quickly. This situation has the potential to lead to duplicate data entry, discrepancies in information between units, parent complaints, loss of records, and delays in decision-making. Through digitization, schools are expected to have a more integrated service system that is easily accessible, maintains a documentation trail, and is capable of providing up-to-date data for school leadership. However, this table also underscores that digitization still requires proper management, particularly regarding data validity, agreed-upon communication channels, equitable access, document security, and the readiness of school human resources.

Theoretical and Conceptual Framework

In this study, digital-based educational management is defined as the process of planning, organizing, implementing, controlling, and evaluating school services with the support of digital systems. Rof et al. (2020) explain that digital

transformation brings about changes in work models and organizational value logic. In schools, this value emerges when services become easier, faster, and more accountable to the school community.

Mohamed Hashim et al. (2022) state that digital strategies in educational institutions need to integrate vision, resources, governance, human competencies, and technological readiness. This point is important because schools often begin their digitalization efforts with applications. However, accelerating services requires a strategic direction. Schools need to determine which services to digitize first, who is responsible for them, how data flows, and how users can receive support.

Farias Gaytan et al. (2023) emphasize that digital literacy in educational institutions is not only about the ability to use tools, but also about the ability to understand the complexities of change. In school settings, digital literacy means that teachers, students, parents, and administrative staff understand procedures, communication ethics, data security, and how to solve simple problems. This literacy determines whether digital services are embraced or, conversely, quietly rejected.

Digital leadership serves as the foundation for acceleration because service transformation requires decision-making, leadership by example, and support. Karakose et al. (2022) note that digital leadership has emerged as a key area in modern leadership studies. School principals need to lead service transformation in a practical manner. School principals set standards, support training, facilitate evaluation, and ensure that no unit operates in isolation.

Connolly et al. (2023) emphasize that digital educational leadership must foster knowledge transformation to ensure the sustainability of knowledge. In school settings, sustainability means that the system does not break down when operators change, teachers are reassigned, or applications are updated. Schools need to have standard operating procedures (SOP), documentation, ongoing training, and a culture of knowledge sharing among staff.

The effectiveness of school services in this study was assessed based on five indicators. The first indicator is service speed. The second indicator is data accuracy. The third indicator is ease of access. The fourth indicator is process traceability. The fifth indicator is user satisfaction and trust. Sanoto et al. (2025) demonstrate that the digitization of school management can improve access to information, service efficiency, and the accuracy of program evaluations.

Aras and Buyukozkan (2023) explain that digital maturity must be viewed holistically because transformation is influenced by strategy, processes, technology, people, and culture. This study uses this perspective to analyze the acceleration of school services. A digitally mature school is not merely one that has many applications. A digitally mature school is one that is able to integrate technology into a well-organized and trusted service process.

Gkrimpizi et al. (2023) categorize the barriers to digital transformation in higher education into organizational, technological, human, and environmental aspects. This categorization can be applied to the context of with appropriate adjustments. Organizational barriers arise from unclear standard operating procedures (SOP).

Technological barriers arise from network issues and system interoperability. Human barriers arise from digital literacy. Environmental barriers arise from parental readiness and data regulations.

Thordsen and Bick (2023) point out that a digital maturity model should not merely be a list of indicators. The model should help organizations understand their stage of development and identify steps for improvement. Therefore, this study does not assign scores to schools. Instead, it examines the acceleration process and maps out which service areas are already functioning, which are still fragile, and which need to be strengthened.

Based on this study, the conceptual framework of this research positions the acceleration of digital-based educational management as a bridge between digital leadership and the effectiveness of school services. Digital leadership provides direction. Data governance provides a basis for decision-making. Standard operating procedures (SOP) provide operational certainty. Digital literacy empowers users. Feedback provides material for improvement. These five elements form the ecosystem of digital school services.

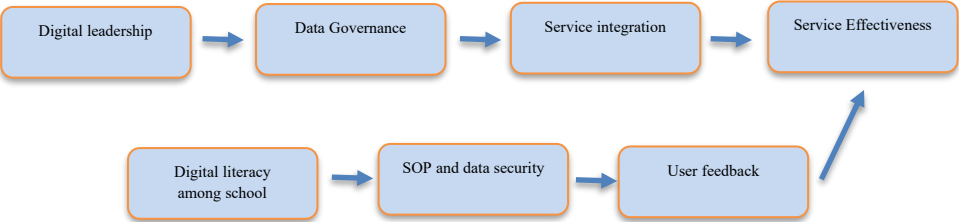


Figure 1. Conceptual Framework for Accelerating Digital School Services

Figure 1 shows that the acceleration of digital school services is driven by a sequential relationship between digital leadership, data governance, service integration, and service effectiveness. Digital leadership serves as the starting point because school principals and management teams must establish the direction, policies, and priorities for the use of digital systems in schools. Following that, data governance is essential to ensure that academic, administrative, communication, and school documentation data are organized and accountable. Service integration is a critical stage because digital systems must not operate in isolation across units but must be interconnected to make services for teachers, students, parents, and school staff more efficient. The effectiveness of school services can be achieved if these digital processes are supported by the digital literacy of the school community, standard operating procedures (SOP) for system use, data security, and user feedback. Thus, this diagram underscores that the success of school service digitization depends not only on technology but also on management readiness, work culture, operational rules, and the involvement of the entire school community.

Table 2. Theoretical and Operational Dimensions of the Study

Dimension	Theoretical basis 2020 and later	Operational meaning in the study
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Digital leadership	Karakose et al. (2021), Karakose et al. (2022), Jameson et al. (2022)	Principals ability to direct, drive, and evaluate digital services
School digital capacity	Timotheou et al. (2023), McCarthy et al. (2023)	Infrastructure readiness, user competencies, policy support, and data usage
Digital maturity	Aras and Buyukozkan (2023), Thordsen and Bick (2023)	Stages of process, human, technology, cultural, and service evaluation readiness
Transformation governance	Hanelt et al. (2021), Konopik et al. (2022), Feroz et al. (2023)	Schools ability to develop adaptive and sustainable digital processes
Service effectiveness	Sanoto et al. (2025), van der Vlies (2020), UNESCO (2023)	Speed, accuracy, traceability, ease of access, and user trust

Table 2 illustrates that this study is structured around five interrelated key dimensions: digital leadership, school digital capacity, digital maturity, transformation governance, and service effectiveness. Digital leadership serves as the foundation because changes in school services require the principal s guidance in mobilizing the school community, setting priorities, and evaluating the use of digital systems. School digital capacity reflects the school s actual readiness, encompassing infrastructure, user competencies, supporting policies, and data utilization. Digital maturity indicates the extent to which a school is prepared to sustainably implement digital processes through human resources, technology, work culture, and service evaluation. Transformation governance emphasizes the importance of digital processes that are not merely temporary but adaptable and sustainable. All these dimensions are aimed at improving the effectiveness of school services, as evidenced by service speed, data accuracy, ease of access, process traceability, and increased user trust in school services.

Previous Research and Research Gaps

Previous studies indicate that school digitization has been examined from the perspectives of leadership, digital capacity, technology use, and service quality. However, most studies still treat digitization as a general phenomenon. There remains a research gap in explaining the mechanisms of acceleration in school services in the field. This study addresses this gap by examining the relationship between managerial decisions, data flows, standard operating procedures (SOP), user experience, and the effectiveness of school services.

Table 3. Five Relevant Previous Studies

Researcher	Focus	Method	Key Findings	Limitations that constitute gaps
Karakose et al. (2021)	The role of principals digital leadership and technological capabilities	Qualitative, based on teachers perspectives	School principals play a role in fostering a digital culture and providing technological support	Has not yet focused on the effectiveness of school administrative services
Dexter and Barton (2021)	Team-based technology leadership in schools	Technology leadership interventions and evaluation	Team leadership can strengthen the use of technology in schools	A stronger focus on instructional leadership than on school services
Timotheou et al. (2023)	The impact of digital technology on education and schools digital capacity	Literature review	Digital capacity is influenced by infrastructure, competencies, policies, and organizational support	Does not yet describe digital service practices through school field data
McCarthy et al. (2023)	Key components of digital transformation in education for system change leaders	Conceptual and literature review	Transformation requires vision, leadership, systems, and changes in practice	Does not explain the school service flow and user experience in detail
Sanoto et al. (2025)	Digitalization of school management and service quality in Indonesian elementary schools	Descriptive qualitative	Digitalization improves information access, service efficiency, and program evaluation accuracy	Further research is needed on acceleration mechanisms and factors hindering cross-user services

Table 3 shows that previous research has extensively addressed school digitization from the perspectives of digital leadership, technology leadership, digital capacity, educational transformation, and the quality of school services. Karakose et al. emphasize the role of school principals in fostering a digital culture, while Dexter and Barton highlight the importance of team-based leadership in the use of school technology. Timotheou et al. and McCarthy et al. expand the discussion to include digital capacity, a vision for transformation, systems, infrastructure, policies, and changes in practice. Sanoto et al. provide a context more closely aligned with elementary schools in Indonesia, particularly regarding improved access to information, service efficiency, and the accuracy of program evaluations. However, these five studies still leave a gap because they have not specifically outlined the mechanisms for accelerating digital-based educational management in improving the effectiveness of school services through the direct experiences of school principals, teachers, administrative staff, students, and parents. This gap forms the critical basis for this study.

Table 4. Research Gaps

Aspect	Trends in Previous Research	Research Gaps	Position of this research
Subject of Study	Much of the literature discusses digital transformation in education in general	Specific studies on school services remain limited	Focuses analysis on academic, administrative, communication, and school documentation services
Focus of analysis	Emphasizes leadership or technology	Mechanisms for accelerating management have not been extensively explained	Connecting leadership, data, SOP, helpdesks, digital literacy, and feedback
Data approach	Primarily consists of literature reviews and surveys	Multi-source field data still needs to be strengthened	Uses interviews, observations, and documentation of school service users
Effectiveness indicators	Effectiveness is often understood as general efficiency	Not yet addressed in terms of speed, accuracy, accessibility, traceability, and trust	Developing service effectiveness indicators based on user experience
Practical contributions	Providing general recommendations	Does not yet offer an operational	Developing a model for accelerating digital-

Table 4 shows that this study occupies a distinct position compared to previous research. Earlier studies generally addressed the digital transformation of education in broad terms, placing greater emphasis on leadership, technology, or general efficiency, and frequently employing literature review and survey approaches. The primary gap lies in the lack of robust field studies specifically addressing school services, particularly how academic, administrative, communication, and documentation services are managed through digital systems. This study fills this gap by focusing on the mechanisms for accelerating digital-based educational management through leadership, data governance, SOP, helpdesks, digital literacy, and user feedback. Furthermore, this study clarifies service effectiveness indicators based on users direct experiences, such as speed, accuracy, ease of access, traceability, and trust. Thus, the contribution of this study is not only theoretical but also practical, as it offers an operational model for digital school services that can be applied within the context of educational management.

Methodology

This study employs a qualitative approach with a field case study design. This design was chosen because the study aims to gain an in-depth understanding of the process of accelerating digital-based educational management within the school context. The focus of the study is to examine practices, experiences, barriers, and the meaning of digital services from the perspectives of both service providers and users.

The study was conducted at a high school that had already implemented several digital services. These services included digital attendance tracking, electronic report cards, a student administration system, electronic document archives, online information channels, and academic service forms. The name of the school has been disguised as School X in this paper to protect the institution's confidentiality. This disguise was used because the study involved an evaluation of the services and user experiences.

The study included 18 informants. This number was determined because the research required a variety of perspectives from decision-makers, administrative staff, teaching staff, students, parents, and school supervisors. This number was also deemed sufficient because, after the 16th interview, recurring patterns of responses began to emerge. The last two informants were used to confirm the consistency of the findings.

Informants were selected through purposive sampling. The primary criterion was direct involvement in the school's digital services. Principals and vice principals were selected because they play a role in planning and oversight. System administrators and administrative staff were selected because they manage data and documents. Teachers were selected because they use academic services.

Students and parents were selected because they receive the services. The committee was selected because it provides a perspective on service oversight.

Data was collected through semi-structured interviews, observations, and documentation. Interviews were used to explore experiences, perceptions, and barriers related to digital services. Observations were used to examine service workflows, system usage, and user interactions. Documentation was used to review standard operating procedures (SOP), digital forms, service records, system screenshots, service schedules, and the school's internal evaluation documents.

The primary research instrument is the researcher. The interview guide was developed based on the research focus, namely the acceleration process, service effectiveness, enabling factors, and barriers. The observation guide was used to record service duration, process sequence, actors involved, communication channels, and the types of assistance provided to users. A documentation checklist was used to verify the existence of documents related to the planning, implementation, and evaluation of digital services.

The data analysis was conducted in four stages. The first stage involved reading all the transcripts and observation notes. The second stage involved coding statements related to digital services. The third stage involved grouping the codes into categories. The fourth stage involved compiling the main themes and a model of the findings. The analysis was conducted iteratively to ensure that relationships between categories were not forced from the outset.

Data validity was ensured through source triangulation, methodological triangulation, informant confirmation, and data trail audits. Source triangulation was conducted by comparing the responses of school principals, teachers, students, parents, and administrative staff. Methodological triangulation was conducted by comparing the results of interviews, observations, and documentation. Informant confirmation is conducted by sharing a summary of interview results with several key informants. Data trail audits are conducted by maintaining records of codes, categories, and analytical decisions.

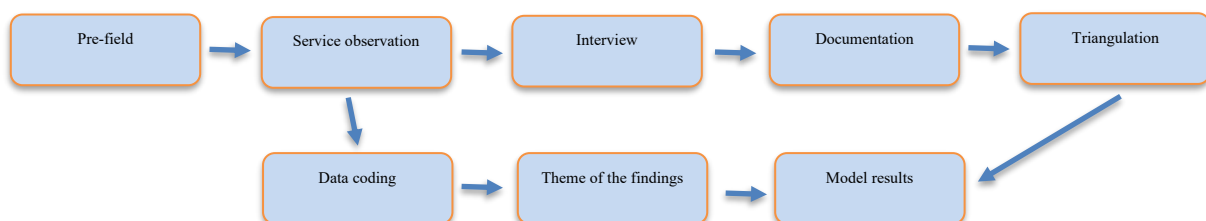


Figure 2. Stages of Field Research

Figure 2 illustrates the stages of the field research, which was conducted systematically from the pre-field phase through to the development of the final model. The pre-field phase was used to prepare the research focus, locations, informants, interview guidelines, and document requirements. Following this, service observations were conducted to directly observe school service processes, such as administration, communication, documentation, and the use of digital systems. Interviews were then conducted with key informants to enable

the researcher to gather firsthand experiences, perspectives, and real-world challenges faced by school service users. Interview data was supplemented with documentation, such as Standard Operating Procedures (SOP), service records, system screenshots, service schedules, and other supporting documents. All of this data was tested through triangulation so that information from observations, interviews, and documentation could reinforce one another. After the data was collected, the researcher coded the data to identify patterns, categories, and key meanings. The coding results were then organized into themes of findings. In the final stage, these themes were formulated into a results model that explains the acceleration of digital-based educational management in improving the effectiveness of school services.

Table 5. Research Informants and Codes

Code	Informant position	Number	Involvement Criteria
KS01	School principal	1	Primary decision-maker for school digital services
WK02	Vice Principal for Curriculum	1	Manages academic services, schedules, and e-reports
OP03	School Administrator	1	Manage core data, accounts, and service uploads
TA04	Administrative staff	1	Managing correspondence, archives, and student document services
GB05	Guidance Counselor	1	Using digital data for student services
GR06 through GR09	Subject Teacher	4	Using attendance records, e-report cards, and academic communication channels
SW10 to SW13	Students	4	Users of academic services and school information
OT14 to OT17	Parents	4	Users of school information, grades, and communication services
KM18	School committee	1	Providing feedback and overseeing school services

Table 5 outlines the composition of the research informants selected based on their direct involvement in digital school services. The informants consist of : the school principal as the primary decision-maker; the vice principal for curriculum as the academic services manager; the school operator as the data and account manager; administrative staff as document service implementers; guidance counselors as users of student service data; subject teachers as users of attendance and e-report cards; students as recipients of academic services; parents as users of information services; and the school committee as the party providing input and oversight. A total of 18 informants was considered sufficient because they represented managerial, operational, and school service user

elements. Informants were selected purposively, namely by choosing parties who truly understood, experienced, and were involved in the process of digitizing school services. With this composition, the research data is expected to be richer because it is obtained from various complementary perspectives.

Table 6. Data Collection Matrix

Data Focus	Interview	Observation	Documentation
Digital service planning	KS01, WK02, OP03, TA04	Service coordination meetings and digital information boards	School work plan, SOP, service schedule
Service implementation	OP03, TA04, GR06 through GR09	Data entry process, document services, use of e-report cards	Service forms, service request records
User experience	SW10 through SW13, OT14 through OT17	User interaction with school information channels	Summary of complaints, service messages, access records
Service effectiveness	All informant groups	Response time, traceability, availability of information	Evaluation reports, digital archives, service summaries
al barriers and strategies	KS01, WK02, OP03, TA04, KM18	Network disruptions, assistance process , data errors	Improvement notes, meeting outcome , training list

Table 6 shows that data collection was conducted using a triangulation approach through interviews, observations, and documentation to ensure that the research data was robust and complementary. Each data focus has different sources depending on the informants involvement in digital school services. Service planning was explored with the principal, vice principal, operators, and administrative staff, as they are involved in developing policies, SOP, and service schedules. Service implementation was observed through data entry processes, document handling, and the use of e-reports so that researchers could directly observe digitization practices. User experiences were gathered from students and parents to understand ease of access, challenges, and the quality of school communication. Service effectiveness was assessed across all informant groups, focusing on response time, traceability, and information availability. Barriers and strategies were examined through both managerial and service implementation teams to identify technical issues, human resource readiness, and improvement measures implemented by the school.

Table 7. Sample Codes and Analysis Categories

Initial code	Category	Theme
Information is accessed more quickly	Access speed	Service effectiveness
Teachers still have to fill out two forms	Duplication of work	Barriers to acceleration
Operators become the focal point of inquiries	Reliance on personnel	Sustainability risks
There is a support group for parents	Support channels	Service strategy
Attendance data is used for coaching	Data utilization	Data-driven management

Table 7 shows an example of the qualitative data analysis process, from initial codes and categories to main themes. Initial codes were derived from informant statements, observation results, or field documents related to digital school services. Codes such as information is accessed more quickly were then grouped into the access speed category and interpreted as part of service effectiveness. The code teachers still filling out two forms indicates work duplication, which acts as a barrier to digital acceleration. The code operator became the focus of inquiry, illustrating a reliance on specific personnel that poses a risk to service sustainability. The code regarding support groups for parents indicates the presence of service strategies to assist users who are not yet familiar with the digital system. Meanwhile, the use of attendance data for professional development demonstrates that digitization not only streamlines administration but also supports data-driven decision-making in school management.

Result

The results section is organized based on data from interviews, observations, and documentation. The description of the results does not rely on theory in order to focus on the informants voices and field findings. Each quote is assigned an informant code to maintain the confidentiality of their identities. The themes of the results include an overview of digital services, acceleration mechanisms, impacts on service effectiveness, barriers, and strengthening strategies.

Research findings indicate that digital services at School X evolved from a practical need to streamline administrative processes. In the early stages, the school s primarily used digital systems for attendance tracking, grade entry, and information dissemination. As the number of users grew, the school began to reorganize its mail, archiving, announcements, and parent communication services. KS01 stated,

At first, we just wanted to reduce lines and paper. Over time, we realized that digital data could help us make decisions faster.

The digitization of services is not proceeding at the same pace across all units. Academic services are moving faster because teachers and students are already

accustomed to using learning apps. Administrative services are moving more slowly because many documents still require verification. TA04 stated,

For letters and archives, we still need to ensure the data is accurate. So not everything is digitized immediately. There are steps to avoid errors.

Acceleration began to be seen when the principal established the official channels for digital services. The school designated official accounts, class groups, digital forms, and document request workflows. WK02 explained,

We re starting to organize our channels. Academic information goes through homeroom teachers. Document requests are handled via forms. Technical complaints go to the admin. So not everything goes to just one person.

Data utilization has become a key component of service improvements. Attendance data, grades, and counseling records are now being used to identify students who need support. GB05 stated,

Digital attendance data helps us identify students who are frequently late or absent. We can reach out to them sooner, rather than waiting until the end of the month.

Teachers have noticed a change in the speed of academic record-keeping. GR07 noted that the e-report card makes the grade processing more organized because the format is already provided. However, teachers also noted an initial learning curve. GR07 stated,

At first, it felt overwhelming because we had to learn the system. Once we got used to it, the record-keeping became more organized and easier to check.

Students view digital services as a way to obtain information without having to ask repeatedly. SW11 said,

If the schedule changes, we find out faster through the official group. In the past, we d sometimes ask our friends first, but now the homeroom teacher sends the information directly.

This statement indicates that digital services speed up access to information, especially regarding routine matters.

Parents feel the benefits in terms of access to academic information and communication with the homeroom teacher. OT15 said,

I don t have to wait for a meeting to find out how my child is doing. If there s information about grades or attendance, the homeroom teacher can let me know faster.

However, parents also asked that information continue to be communicated in simple language to avoid misunderstandings.

School administrators play a key role in this acceleration. OP03 explained that many digital processes depend on the accuracy of initial data.

If student data is incorrect from the start, the consequences are far-reaching. Accounts can be problematic, report cards can be inaccurate, and letters can also be incorrect.

This statement highlights that the effectiveness of digital services is highly dependent on data accuracy.

Observations indicate that the school has implemented several digital service workflows. Requests for certificates are submitted via a digital form. Confirmation is sent via an official message. Documents can be picked up after verification. This process makes the service more traceable, as each request includes a submission time and the applicant's name.

School documentation indicates the existence of simple SOP for announcements, grade entry, and document requests. These SOP are not yet fully detailed, but they already provide basic guidance. TA04 stated,

The SOP helps us answer the same questions. If a parent asks, we just explain the process.

The effectiveness of the service is evident in the speed of information distribution. Announcements that were previously posted on the school bulletin board are now sent through official channels. SW13 noted,

Information about competitions, schedules, and class changes gets out faster. We don't have to wait to check the bulletin board.

This speed reduces delays in information for students.

Effectiveness is also evident in the accuracy of academic data. Teachers can review grades before they are finalized. Homeroom teachers can identify incomplete data. WK02 stated,

With this system, we can see which teachers haven't entered their data yet. We don't issue warnings based on guesswork. The data shows exactly which parts are still incomplete.

Service traceability is the change most felt by administrative staff. TA04 stated,

When requests come through the form, we know who made the request, when it was submitted, and what the need is. That makes it easier for us to set priorities.

Traceability helps schools reduce lost or delayed requests that aren't documented.

Parents perceive digital services as more transparent when information is communicated through official channels. OT16 said,

What makes it reassuring is that all parents receive the same information. So there are no conflicting reports.

This transparency reduces uncertainty, particularly regarding schedules, payments, activities, and learning outcomes.

Nevertheless, digital literacy barriers still exist. Some parents are not yet accustomed to filling out digital forms. OT17 said,

Sometimes I'm afraid of filling it out incorrectly. If there were an example of how to fill it out, it would be easier for me.

This challenge highlights that digital services need to be accompanied by brief guides and direct assistance.

Challenges also arise from teachers who feel they still have to do double the work. GR09 said,

Sometimes we've already entered data into the system, but we're still asked to provide a manual summary for the archives. If both processes continue, the digital aspect feels like it's adding to the workload.

This issue highlights the need for managerial decisions to eliminate unnecessary formats.

Internet connectivity is a technical obstacle that affects the smooth operation of the service. OP03 stated,

If the network is slow during the input deadline, everyone panics. We need an input schedule that doesn't pile up the work.

The school then began to stagger the data upload schedule to prevent the system from being overloaded at the same time.

Reliance on a single operator poses a risk to service continuity. KS01 acknowledged,

We must not make everything dependent on a single operator. If the operator is unavailable, the service must continue to run.

Therefore, the school began training two backup staff members to understand the workflow for accounts, data, and digital documents.

The support channel emerged as a strategy driven by on-site needs. The school compiled a list of frequently asked questions and designated a service administrator to address basic issues. SW10 stated,

If there's an issue with an account, we know who to contact. We no longer have to go back and forth asking multiple teachers.

The support channel reduces the workload of homeroom teachers and speeds up problem resolution.

Internal training is kept simple. More experienced teachers help others. The system administrator provides brief guidance to the administrative staff. WK02 said,

We don't always wait for formal training. Sometimes an hour after a meeting is enough to try out new features together.

This approach makes digital learning more aligned with work needs.

Service evaluations are conducted through regular meetings and user feedback. KM18 stated,

The committee has taken parents' concerns to heart. A common theme is the need for clear information that isn't delivered at the last minute.

Schools used this feedback to improve announcement schedules, message formats, and response times.

In general, the research findings indicate that the acceleration of digital-based educational management does not stem from specific applications. The acceleration occurs because schools have begun to streamline service workflows, assign roles, improve data management, establish support channels, and listen to user feedback. Digitalization becomes effective when managed as a service system, not merely as an administrative requirement.

Table 8. Summary of Key Findings from the Study

Theme	Field Indications	Supporting informant codes	Meaning of Findings
Digital leadership	The principal establishes official channels and service priorities	KS01, WK02, KM18	Acceleration requires direction and control
Data integration	Attendance, grade, and administrative data begin to be used across services	OP03, GB05, GR07	Data forms the basis for services and decisions
Streamlining workflows	Digital forms are used to request documents	TA04, OT15, SW11	Services become faster and trackable
Support channels	Service admin and quick guides are used to resolve issues	OP03, SW10, OT17	Users need easily accessible support
Feedback-based evaluation	Parent meetings and input are used to improve services	KM18, KS01, WK02	Digital services need to be improved iteratively

Table 8 shows that the research findings yielded five main themes that explain the acceleration of digital-based educational management in school services. The first theme is digital leadership, as evidenced by the principal's role in establishing official channels and service priorities so that the digitization process has a clear direction. The second theme is data integration, which involves the cross-service utilization of attendance, grade, and administrative data so that data is not merely stored but also used to support school decisions. The third theme is process simplification, evident through the use of digital forms to expedite document requests and make service processes easier to track. The fourth theme is support channels, indicating that users still require service administrators and brief guides to resolve technical issues. The fifth theme is

feedback-based evaluation, which involves using parent meetings and input to continuously improve services. Overall, this table confirms that the effectiveness of school digital services stems from a combination of leadership direction, data management, simple service workflows, user support, and continuous evaluation.

Table 9. Effectiveness of School Services Following Digital Acceleration

Effectiveness indicators	Forms of change observed	Examples of field evidence
Speed	Announcements and documents are received by users more quickly	Information on classes, schedules, and activities is sent through official channels
Accuracy	Grades, attendance, and identity data are easier to verify	Teachers and administrators can view incomplete data
Ease of access	Students and parents can access information without always having to come to school	Digital forms and official groups are used for basic services
Traceability	Service requests have a submission time and an assigned person in charge	Digital forms store a history of requests
Trust	Information is more consistent and verifiable	Parents rely on the school's official channels

Table 9 shows that digital acceleration can improve the effectiveness of school services across five key indicators: speed, accuracy, accessibility, traceability, and trust. Speed is evident in the faster delivery of announcements, schedules, activities, and document services through the school's official channels. Accuracy improves because data on grades, attendance, and student identities can be verified by both teachers and administrators, making it easier to identify errors or incomplete data. Ease of access is evident in the ability of students and parents to obtain basic information without always having to come to school. Traceability has also improved because service requests via digital forms include a record of the time of submission and the person responsible. Additionally, the use of official channels makes school information more consistent, easier to verify, and trusted by both parents and the school community.

Table 10. School Management Challenges and Responses

Challenges	Impact on services	School Response
Uneven digital literacy	Users are afraid of filling out the form incorrectly or do not understand the process	Brief guides, admin support, and sample forms

Duplicate data entry	Teachers feel their workload has increased	Evaluate manual formats and reduce unnecessary summaries
Reliance on operators	Service is at risk of interruption if the operator is unavailable	Training of backup staff and documentation of procedures
Unstable network	Delayed data uploads and service delays	Scheduling of data entry and prioritization of critical services
SOP are not detailed	Responses between units are not always consistent	Development of service SOP by type of need

Table 10 shows that the digital transformation of school services still faces several obstacles that need to be seriously addressed by school administrators. The first obstacle is the uneven level of digital literacy, meaning that some users are still afraid of making mistakes or do not yet understand the workflow of digital services. Other obstacles arise from duplicate data entry, which increases teachers workload; reliance on operators, which can disrupt service continuity; unstable internet connections; and service SOP that lack detail. To address these conditions, schools have implemented several managerial steps, such as providing brief guides, administrative support, form-filling examples, manual format evaluations, training for backup staff, scheduling data entry, and developing SOP for each type of service. Thus, this table underscores that digitization is not merely about providing a system but also requires strengthening digital literacy, task distribution, work procedures, infrastructure, and continuous evaluation to ensure school services operate more stably and effectively.

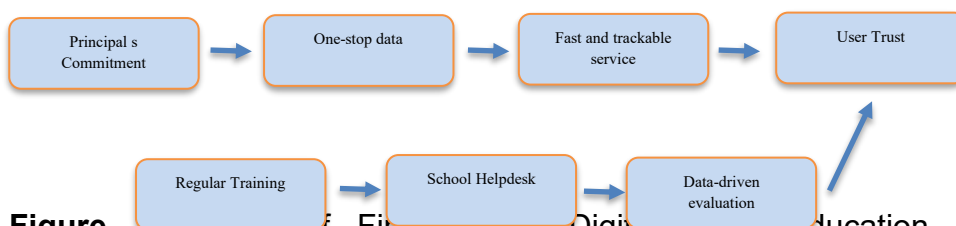


Figure 3. Model of Findings on Digital-Based Education Management Acceleration

Figure 3 illustrates a model for accelerating digital-based educational management, which begins with the commitment of the school principal as the primary driver of service transformation. This commitment is focused on establishing a single data portal so that school information is not scattered across multiple locations and is easier to manage. Well-organized data then supports fast and traceable services, allowing users to access information, documents, and service assistance more clearly. On the support side, regular training is necessary so that teachers, administrative staff, students, and parents can use digital services correctly. The school helpdesk serves as a support center when users encounter technical issues or have difficulty understanding service

workflows. Furthermore, data-driven evaluations are used to identify emerging issues, improve procedures, and tailor services to user needs. The entire process ultimately builds user trust, as school services become faster, more transparent, measurable, and accountable.

Discussion

Research findings indicate that the acceleration of digital-based educational management is influenced by schools ability to manage change as a managerial process. Hanelt et al. (2021) emphasize that digital transformation is a strategic change that affects organizational structure, processes, and logic. Field findings align with this idea because digital services become effective when schools manage official channels, document workflows, role distribution, and data usage. Thus, school digitization should be viewed as a service reform, not merely a modernization of tools.

The principal s role appears to be significant in the early stages of acceleration. Karakose et al. (2021) explain that principals play a role in fostering a digital culture and supporting technological capabilities. In this study, principals not only provided general guidance but also set service priorities and reduced confusion regarding communication channels. These decisions gave the digital services a clear direction. Without clear leadership, applications might operate in isolation rather than functioning as an integrated school service system.

Findings regarding the division of service channels highlight the importance of digital governance. Mohamed Hashim et al. (2022) state that educational institutions digital strategies require a combination of vision, resources, competencies, and processes. School X began to achieve this combination when academic, administrative, and communication services were separated yet remained interconnected. This practice enhances effectiveness because users know which service channels to use.

Data is central to service acceleration. Konopik et al. (2022) explain that organizations need to master the capabilities required to manage digital transformation through process and data capabilities. In schools, attendance data, grades, identity information, and documents serve as the foundation for services. Findings indicate that initial data errors can lead to a cascade of problems. Therefore, digital acceleration must begin with data discipline, not with the addition of applications.

The effectiveness of services in this study is reflected in speed, accuracy, ease of access, traceability, and user trust. Sanoto et al. (2025) found that the digitization of school management can improve access to information, service efficiency, and the accuracy of program evaluations. The findings of this study expand on those results by demonstrating the underlying mechanisms. Access improves because official channels are established. Efficiency improves because digital forms retain a record of requests. Accuracy improves because data can be verified before use.

Support channels are an element that is often overlooked in school digitization. Farias Gaytan et al. (2023) emphasize the importance of digital literacy in navigating the complexities of this transformation. Research findings indicate that simply providing users with an app is not enough. They also need guidance, examples, and a place to ask questions. Without support channels, digital services can cause anxiety for parents and place an additional burden on teachers.

The issue of double work highlights that digitalization may fail to streamline services if outdated procedures are retained without evaluation. Thordsen and Bick (2023) note that digital maturity should help organizations identify areas for improvement. In the case of School X, the use of digital systems has not yet fully replaced manual processes. This issue needs to be addressed through management decisions to prevent teachers from facing a double administrative burden.

Reliance on individual staff members poses a risk to sustainability. Connolly et al. (2023) emphasize the importance of knowledge sustainability in digital education leadership. Schools need to ensure that service procedures, system access, and technical knowledge are not the sole responsibility of a single person. Training backup staff and documenting procedures are key strategies to ensure that services continue uninterrupted during staff turnover.

Findings on the use of attendance data for student guidance indicate that digital services can shift from administrative tasks to educational decision-making. Timotheou et al. (2023) demonstrate that the impact of technology on education is influenced by a school's digital capacity. This capacity is evident when data is not merely stored but used to inform guidance interventions. In this way, digital services contribute to educational functions, not merely administrative ones.

McCarthy et al. (2023) emphasize that the digital transformation of education requires leadership, vision, infrastructure, and changes in practice. This study demonstrates that these components are manifested in concrete ways. Vision is evident in the establishment of a one-stop service. Infrastructure is evident in the use of applications and networks. Changes in practice are evident in digital forms, electronic archives, and data-driven evaluation meetings. Leadership ties all these components together.

The research findings also indicate that parents need transparency and information presented in simple language. UNESCO (2023) emphasizes that educational technology should be viewed from the perspective of the user and the context, rather than solely as a tool. These findings align with that perspective. Fast-paced digital information is not always effective if the language is too technical or there are too many channels. Digital services must be user-friendly so as not to create a new divide between schools and families.

The acceleration model identified in this study can be outlined in five stages. The first stage is digital leadership commitment. The second stage is the organization of data and service channels. The third stage is the development of simple standard operating procedures (SOP). The fourth stage is strengthening digital literacy and the helpdesk. The fifth stage is feedback-based evaluation. Aras and

Buyukozkan (2023) support this framework through the concept of digital maturity, which integrates strategy, processes, people, technology, and culture.

The theoretical implications of this study highlight the need to integrate research on educational management, digital leadership, and the effectiveness of school services. Karakose et al. (2022) position digital leadership as an evolving field. This study demonstrates that digital leadership in schools can be observed through daily service practices. These practices include data management, communication channel management, user training, and service evaluation.

The practical implication of this study is that schools need to develop a digital service map before adding new applications. This map includes the type of service, the person in charge, data flow, response time, risks, and support channels. Gkrimpizi et al. (2023) explain that barriers to digital transformation encompass organizational, technological, human, and environmental aspects. A service map helps schools identify these barriers in a more systematic way so that improvements are not merely reactive.

This study has limitations. The data comes from only one school, so the findings are not intended to be statistically generalized. Informant quotes also reflect experiences within a single institutional context. However, the depth of the data provides insight into how the acceleration of digital services works in school practice. Future research could expand the scope to include multiple locations, compare public and private schools, or test this model using a mixed-methods approach.

Table 11. Synthesis of Discussion and Implications

Findings	Theoretical Support 2020 and Beyond	Implications for Schools
Acceleration is driven by leadership and the structuring of official channels	Karakose et al. (2021), Jameson et al. (2022)	Principals need to establish service channels and response standards
Effectiveness arises when data is clean and easy to track	Konopik et al. (2022), Hanelt et al. (2021)	Schools need to establish data input and validation protocols
Users need assistance and guidance	Farias Gaytan et al. (2023), UNESCO (2023)	Schools need to create a help desk and brief service guides
Duplicate formats hinder service acceleration	Thordsen and Bick (2023), Gkrimpizi et al. (2023)	Unnecessary manual formats need to be phased out
Feedback strengthens service sustainability	Connolly et al. (2023), McCarthy et al. (2023)	Evaluation meetings should be based on service data and user complaints

Table 11 shows that the research findings are directly linked to the latest theories and yield practical implications for schools. The acceleration of digital services

cannot proceed without clear leadership; therefore, school principals need to establish official channels, response standards, and guidelines for using the system. The effectiveness of these services also depends on data quality, as clean, valid, and traceable data will help schools make faster and more accurate decisions. On the user side, schools need to provide a help desk and brief guides so that teachers, students, and parents do not encounter difficulties when using digital services. Obstacles such as format duplication need to be gradually reduced so that digitization does not add to the workload. In addition, user feedback needs to be used as the basis for routine evaluations so that school services continue to be improved in line with real needs in the field.

Conclusions and Recommendations

This study concludes that the acceleration of digital-based educational management in improving the effectiveness of school services is not solely determined by the availability of applications. Acceleration is determined by the school's ability to organize leadership, data, workflows, SOP, user literacy, support channels, and evaluation. Applications serve as tools. Management is the primary driver of service transformation.

The effectiveness of school services has improved in five key areas. Services are faster because information is disseminated through official channels. Services are more accurate because data can be verified and tracked. Services are more accessible because students and parents do not always have to come to school. Services are more transparent because all users receive the same information. Services are more trustworthy because the process is traceable and has designated responsible parties.

The main barriers to accelerating digital services include uneven digital literacy, the duplication of work between digital and manual formats, reliance on operators, network constraints, and insufficiently detailed standard operating procedures (SOP). These barriers indicate that digitization must not stop at system implementation. Schools need to consistently manage changes in work behavior and user experience.

The first recommendation is directed at school principals. Principals need to develop a school digital service map that includes service types, responsible parties, data flows, response times, support channels, and data security standards. This map can serve as the basis for service planning and evaluation.

The second recommendation is directed at teachers and administrative staff. Teachers and administrative staff need to be involved in developing SOP to ensure that digital procedures align with actual working conditions. Internal training should be brief, regular, and directly focused on service-related issues.

The third recommendation is directed at schools as service organizations. Schools need to establish a simple helpdesk to assist students and parents. The helpdesk does not have to be a large unit. It can consist of a service administrator, brief guidelines, a list of frequently asked questions, and a schedule for technical support.

The fourth recommendation is directed at future researchers. Further research could compare this acceleration model across several schools with different characteristics. Quantitative research could also examine the relationship between digital leadership, digital maturity, and satisfaction with school services.

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