



Quality of Digital Governance in Early Childhood Education Through Adaptive Leadership of Unit Heads in Rural Indragiri Hulu

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ABSTRACT

The quality of digital governance in early childhood education in rural areas remains a critical issue because service digitalization has not always been supported by adequate leadership readiness, quality assurance systems, data literacy, and organizational capacity. This study aimed to map scientific evidence on the quality of digital governance in early childhood education through the adaptive leadership of unit heads and to formulate relevant knowledge gaps as a basis for a preliminary study in the rural context of Indragiri Hulu. A systematic literature review design was employed by referring to the PRISMA guidelines. Further selection was conducted based on abstract relevance, DOI availability, focus on early childhood education, governance, leadership, technology, quality, and the priority of empirical data, resulting in 13 core articles. The findings indicate that digital governance in early childhood education should be positioned as a quality ecosystem that integrates digital documentation, family communication, assessment, datafication, quality assurance, and adaptive leadership. In rural areas, digitalization in early childhood education needs to be designed in a simple, participatory, evidence-based manner that does not increase the administrative burden of education units. This review contributes to clarifying the conceptual foundation for developing digital governance in early childhood education based on adaptive leadership to improve the quality of early childhood services in rural areas.

INTRODUCTION

Early childhood education has been positioned as a basic service that determines learning readiness, developmental equity, and the quality of children's transition to the next level of education. The quality of early childhood education services is not determined only by curriculum and pedagogical interaction, but also by unit governance, service sustainability, organizational capacity, and the ability of the system to respond to local needs. In Indonesia, the sustainability of rural early childhood education services has been shown to be influenced by institutional support, community capacity, and operational conditions that are not always stable (Nakajima et al., 2021). In the international context, the quality of early childhood education and care is also related to organizational inclusion, the characteristics of provider systems, and institutional responses to public responsibility (van der Werf et al., 2021). Recent evidence from rural Indonesia shows that the characteristics of the surrounding environment of early childhood education units are also related to service quality and child development (Klaas, 2025). Therefore, early childhood education governance needs to be understood as an interconnected issue of quality, equity, and service sustainability.

Digital transformation has expanded the scope of early childhood education governance because documentation, family communication, learning planning, and quality evaluation are increasingly mediated by technology. Children's and teachers' engagement with digital technology in early childhood education and care has been mapped as a practice that requires pedagogical guidance, not merely device use (Undheim, 2022). The adoption of digital educational resources by early childhood education teachers is also influenced by knowledge, value evaluation, expectations, usefulness, and technology acceptance (Sosa-Alonso et al., 2025). Among preservice teachers, critical digital literacy can be strengthened through service learning and online social capital that support ethical awareness in technology use (Lo et al., 2024). Preservice early childhood teachers' attitudes toward technology have also been shown to be positive, although they remain diverse and are related to their perceived digital competence (Merjovaara et al., 2024). This research landscape indicates that digitalization in early childhood education has shifted from an issue of devices to human readiness, ethics, and quality governance.

The state of the art shows that leadership is the main link between digital transformation, organizational capacity, and quality improvement in early childhood education. A digital leadership model in early childhood settings has been explained through the attitudes, cognition, and capabilities of unit heads in leading technology-based change (Luo et al., 2024). In Indonesia, digital leadership has been shown to influence the organizational capabilities of early childhood education institutions, although gaps between digitalization needs and organizational readiness remain visible (Mulyaniapi et al., 2024). Research on leadership in early childhood education and care also emphasizes that leadership needs to be understood as a profession that demands expertise, legitimacy, and an orientation toward quality development (Heikkinen et al., 2024). In addition, technology-supported strategic management, digital

leadership, and teacher readiness have been reported to be associated with quality improvement in early childhood education (Syarifudin & Muttaqin, 2025). Thus, the adaptive leadership of unit heads becomes essential for translating digitalization into operational quality governance.

Although research on early childhood education quality, digitalization, and leadership has developed, knowledge gaps remain in the specific relationship between digital governance, adaptive leadership of unit heads, and the needs of rural early childhood education services. Datafication in early childhood education has been debated because it may strengthen accountability while also creating the risk of simplifying pedagogical practice (Paananen et al., 2024). Quality improvement frameworks in early childhood education and care also require reflective dialogue between practitioners and researchers so that quality assessment does not become merely an administrative procedure (Baustad et al., 2025). Literature on preservice teacher preparation for technology use shows that digital competence formation must be carried out systematically from teacher education (Papavlasopoulou et al., 2024). This study aimed to map scientific evidence on the quality of digital governance in early childhood education through the adaptive leadership of unit heads in rural areas. The research question addressed how the research landscape, main evidence, specific gaps, and conceptual contributions can be used as a basis for a preliminary study in the context of Indragiri Hulu.

LITERATURE REVIEW

Digital Governance in Early Childhood Education

Digital governance in early childhood education refers to the systematic use of digital technologies to support planning, documentation, communication, assessment, quality assurance, and decision-making processes within educational institutions. The concept extends beyond technology adoption and emphasizes the integration of digital systems into organizational management and service improvement. Research indicates that digital technologies can strengthen program quality, family engagement, leadership practices, and organizational effectiveness when implemented within a comprehensive quality framework (Hatzigianni et al., 2023). However, successful digital governance requires adequate digital literacy, infrastructure readiness, ethical data management, and contextual adaptation to local needs.

Adaptive Leadership in Educational Organizations

Adaptive leadership is a leadership approach that enables leaders to respond effectively to changing environments, complex challenges, and emerging opportunities. In educational settings, adaptive leaders facilitate organizational learning, encourage participation, and adjust strategies according to contextual demands. Leadership studies in early childhood education highlight the importance of flexibility, collaboration, and responsiveness in managing educational quality and organizational development (Heikkinen et al.,

2024). Digital transformation further increases the need for adaptive leadership because educational leaders must balance technological innovation with pedagogical values, stakeholder expectations, and institutional capacity (Luo et al., 2024).

Quality Assurance and Data-Informed Decision Making

Quality assurance has become a central component of educational governance because it provides mechanisms for monitoring, evaluating, and improving educational services. In early childhood education, quality assurance systems increasingly rely on digital documentation and data-based evaluation processes. Previous studies suggest that assessment results can strengthen internal quality improvement when organizations actively utilize evidence for reflection and decision-making (Pronmaboon et al., 2026). Nevertheless, the growing use of data in educational governance has also generated concerns regarding excessive standardization and the potential reduction of complex educational processes into administrative indicators (Paananen et al., 2024; Benerdal & Larsson, 2024).

Digital Governance and Rural Early Childhood Education Contexts

The implementation of digital governance in rural educational settings presents unique opportunities and challenges. Rural early childhood education providers often face limitations related to infrastructure, financial resources, technological access, and professional support networks. Governance effectiveness in rural contexts is therefore influenced by local capacity, community participation, and institutional adaptability (Ravines Merino et al., 2025). Studies conducted in rural Indonesia further demonstrate that sustainable educational services depend on organizational resilience, community involvement, and context-sensitive management practices (Nakajima et al., 2021; Klaas, 2025). Consequently, digital governance models for rural early childhood education should prioritize simplicity, accessibility, and responsiveness to local conditions.

Relationship Between Digital Governance, Adaptive Leadership, and Service Quality

Existing literature suggests that digital governance and adaptive leadership are closely connected in efforts to improve educational quality. Digital systems provide information, communication channels, and quality-monitoring tools, while adaptive leadership enables educational leaders to interpret data, mobilize stakeholders, and implement improvements effectively. Leadership characterized by trust, distributed responsibility, transparency, and stakeholder engagement has been found to support organizational quality development and policy implementation (Eshaghi et al., 2026; Ali et al., 2026). Despite these findings, limited research has specifically examined how adaptive leadership of unit heads contributes to the quality of digital governance in rural early

childhood education settings. This gap highlights the need for further investigation into the mechanisms through which leadership practices can optimize digital governance and improve service quality in rural communities.

METHOD

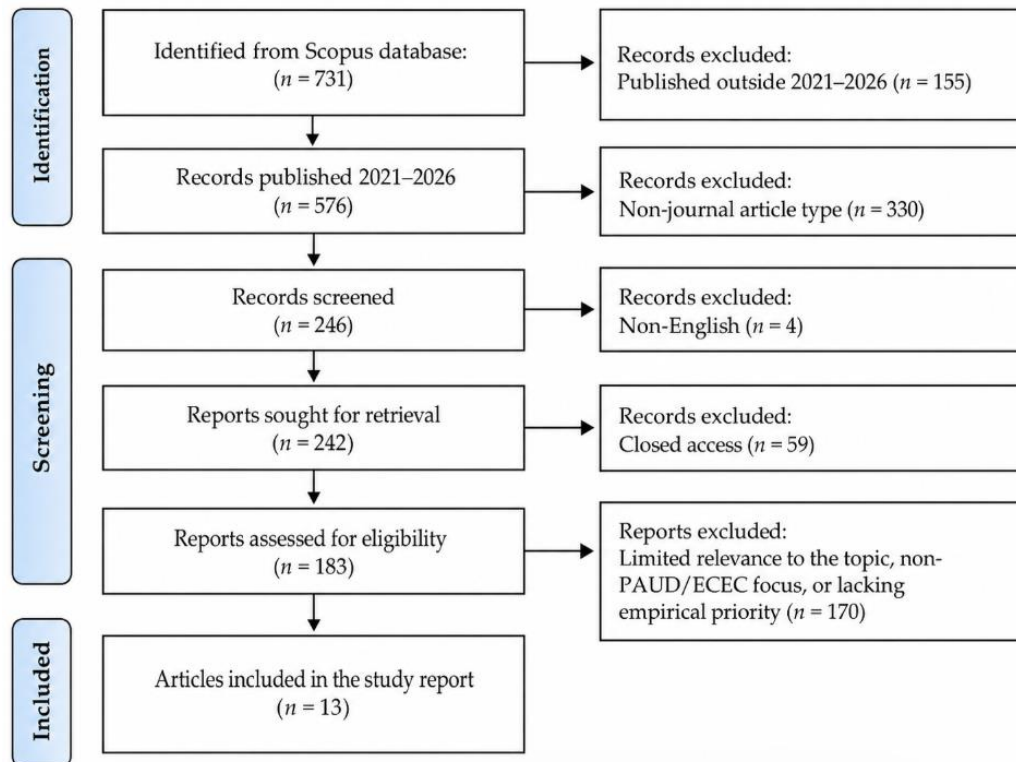
This study employed a systematic literature review design using the identification, screening, eligibility, and inclusion stages based on the PRISMA principles. The initial search was conducted in the Scopus database using the search string “early childhood education” AND leadership AND management AND technology AND QUALITY AND governance AND school. The initial search produced 731 documents. After the publication year restriction of 2021–2026 was applied, the number of documents was reduced to 576. Further screening based on the journal article document type resulted in 246 articles. After the English-language restriction was applied, 242 articles remained. The All Open Access filter then produced 183 articles eligible for further screening.

The eligibility screening stage was conducted by examining titles, abstracts, DOI availability, and substantive relevance. Articles were included when they met several criteria, namely discussing early childhood education, preschool, kindergarten, early childhood education and care, or child development centers, containing one or more focuses on governance, quality, leadership, management, digitalization, datafication, technology, policy, or service quality improvement, having a traceable DOI, and presenting empirical data or analysis based on policy documents and relevant quality reports. Articles were excluded when they focused on higher education, secondary education, non-education sectors, general health, non-early childhood education technology, conceptual studies that were too distant from the theme, review articles that did not provide primary data or empirical context, and articles without direct relevance to the quality of digital governance in early childhood education through unit leadership. Duplication checks were carried out through similarities in titles, authors, and DOI. No duplicate articles or retracted articles were found in the final article group.

At the identification stage, 731 articles were found from Scopus. After the 2021–2026 year filter was applied, 576 articles remained. After the journal article document type filter was applied, 246 articles remained. After the English-language filter was applied, 242 articles remained. After the All Open Access filter was applied, 183 articles remained. At the eligibility screening stage, 183 articles were reviewed through their titles and abstracts. A total of 170 articles were excluded because they did not meet thematic proximity, did not focus on early childhood education or early childhood education and care, were not relevant to digital governance, quality, leadership, or service management contexts, and did not meet the priority for empirical data. At the inclusion stage, 13 articles were selected as core articles for closed narrative synthesis.

PRISMA Flowchart

The following section presents the article selection flow based on the PRISMA guidelines, from the identification stage in the Scopus database to the final inclusion of articles that met the eligibility criteria for further analysis in this study. This flow outlines the number of records at each stage and the reasons for exclusion applied systematically, as shown in Figure 1.



RESULTS

The screening results showed that the 13 included articles had substantive proximity to the quality of digital governance in early childhood education, adaptive leadership of unit heads, quality assurance, datafication, technology, digital communication, and early childhood service governance contexts. The selected articles did not focus only on technology use, but also positioned digitalization as part of quality systems, organizational management, policy, and leadership. The research designs varied and included qualitative studies, case studies, quantitative surveys, mixed-method research, document analysis, autoethnography, and development research. This distribution shows that digital governance in early childhood education is a cross-approach field that requires careful conceptual and empirical synthesis.

Table 1. Results of the Review of Included Articles

No	Author	Conclusion
1	Prommaboorn et al. (2026)	The utilization model of external assessment was shown to be practical for strengthening internal quality assurance systems through organizational commitment, participation, and adaptation of assessment results.

No	Author	Conclusion
2	Kölemen & Yildirim (2025)	Teachers perceived AI as having potential to improve children's literacy and computational thinking, but readiness was limited by AI literacy, infrastructure, data security, and content.
3	Hatzigianni et al. (2023)	Digital technology supported quality improvement in early childhood education and care, particularly in learning programs, family-community partnerships, and service governance and leadership.
4	Riddersporre & Stier (2022)	Digital communication facilitated school-parent interaction, but insensitivity to cultural backgrounds could increase the risk of miscommunication in multicultural preschool services.
5	Eshaghi et al. (2026)	Distributed leadership worked through trust, empowerment, social relations, decision-making transparency, and online communication platforms that strengthened inclusiveness.
6	Öqvist & Cervantes (2024)	Preschool principals need to combine management and leadership so that teachers have adequate working conditions to be responsible for teaching.
7	Ravines Merino et al. (2025)	Governance structures were significantly correlated with the effectiveness of early childhood policy, especially in rural communities with limited resources.
8	Benerdal & Larsson (2024)	Datafication appeared in early childhood education and care quality reports through reflective and audit-based evaluative imaginaries, so evaluation influenced practice, values, and service operations.
9	Haugset & Finne (2024)	Local quality networks shaped quality development strategies among early childhood education and care providers through coercive, normative, and mimetic pressures that interacted with organizational contexts.
10	Ali et al. (2026)	Leaders' normative commitment became the strongest predictor of early childhood education policy implementation, followed by affective and continuance commitment in fragile education systems.
11	Toivonen (2024)	Datafication of child-staff ratios affected early childhood education and care directors' work affectively, administratively, and ethically because data became both a tool of control and resistance.
12	Fonsén et al. (2024)	Pedagogical leadership remained important during crises, but its practice had to be adaptive to context,

No	Author	Conclusion
		uncertainty, changes in teacher roles, and service quality.
13	Irvine et al. (2024)	Meaningful engagement in the assessment and rating process triggered continuous quality improvement through curriculum knowledge, teamwork, and collaborative leadership.

DISCUSSION

The synthesis findings show that digital governance in early childhood education cannot be limited to the provision of devices or applications, but must be positioned as a quality improvement mechanism connected to documentation, communication, data protection, and unit leadership. Digital technology has been reported to support learning program areas, family partnerships, and governance and leadership in early childhood education and care (Hatzigianni et al., 2023). However, digital communication does not always create inclusive relationships because preschool heads may still overlook parents' cultural backgrounds when managing online communication (Riddersporre & Stier, 2022). A similar pattern is also evident in the application of AI in early childhood education, which is accepted as a learning opportunity but remains questioned due to literacy readiness, infrastructure, privacy, and data security (Kölemen & Yıldırım, 2025). Datafication also shapes how quality reports are read, assessed, and directed in preschool evaluation practice (Benerdal & Larsson, 2024). Thus, digital governance in early childhood education needs to be understood as a quality ecosystem that integrates technology, data ethics, and local leadership capacity.

The quality of early childhood education governance appears stronger when quality assurance systems do not stop as administrative obligations, but are used to guide decisions, improve practice, and expand participation. The utilization model of external assessment in child development centers shows that organizational commitment, participation, attitudes toward quality assurance, and adaptation of assessment results become levers for internal quality systems (Prommaboon et al., 2026). At the policy level, inclusive and articulated governance structures are correlated with the effectiveness of early childhood policies in rural communities with limited resources (Ravines Merino et al., 2025). On the service provider side, local quality networks can direct organizational strategies through normative and mimetic pressures that are not always uniform (Haugset & Finne, 2024). Assessment and rating processes also become catalysts for quality improvement when they are interpreted as shared learning spaces, not merely compliance control (Irvine et al., 2024). Therefore, early childhood education quality is more likely to improve when evaluation mechanisms are transformed into collective reflection processes that encourage evidence-based decisions.

The adaptive leadership of unit heads becomes an important node because digital change, quality demands, and resource limitations must be translated into organizational actions that teachers can implement. Distributed leadership in

early childhood education was found to work through trust, empowerment, transparency, and social relations that enabled more inclusive decision-making (Eshaghi et al., 2026). However, leadership alone is not sufficient when unit heads are unable to combine managerial functions and pedagogical leadership in providing working conditions that support preschool teachers (Öqvist & Cervantes, 2024). In crisis situations, early childhood education leadership still needs to maintain pedagogical orientation while adapting practice to uncertainty and changes in teacher roles (Fonsén et al., 2024). Policy implementation is also stronger when leaders' normative commitment appears as a moral responsibility toward institutional goals (Ali et al., 2026). Thus, adaptive leadership in early childhood education needs to be developed as the ability to connect quality mandates, teacher support, policy ethics, and digital change contextually.

Datafication provides opportunities for digital governance in early childhood education, but it also creates tension between administrative efficiency and pedagogical values. Preschool quality reports show that data can change how quality is imagined, especially when evaluation shifts from professional reflection toward a more standardized audit logic (Benerdal & Larsson, 2024). At the leadership experience level, child-staff ratio data does not merely function as managerial information, but also affects the bodies, emotions, responsibilities, and resistance of early childhood education and care directors (Toivonen, 2024). Therefore, the use of digital platforms for quality documentation must be accompanied by leadership interpretation that understands the service context, not merely by reading indicators. The risk of miscommunication in digital communication with parents indicates that technological access is not always identical to communication justice (Riddersporre & Stier, 2022). On the other hand, technology remains valuable when it is positioned within a holistic quality improvement framework (Hatzigianni et al., 2023). Good digital governance must maintain a balance between data accountability, the protection of human relationships, and sensitivity to social contexts.

For rural areas such as Indragiri Hulu, this synthesis points to the need for a digital governance model in early childhood education that has a low technological burden, is strong in adaptive leadership, and is based on quality evidence that can be used by unit heads. The model needs to integrate the utilization of external assessment results, strengthening of local networks, and stakeholder participation so that resource limitations do not become permanent barriers (Prommaboon et al., 2026; Ravines Merino et al., 2025; Haugset & Finne, 2024). At the unit level, digital platforms should be directed toward quality documentation, family communication, program monitoring, and teacher reflection, not merely administrative archiving. Distributed leadership and normative commitment can strengthen the sustainability of change when unit heads do not work alone, but activate teachers and communities as quality actors (Eshaghi et al., 2026; Ali et al., 2026). The findings from the included articles indicate an important contextual gap, namely the lack of a strong empirical basis that specifically connects digital governance in early childhood education, adaptive leadership of unit heads, and service quality needs in rural areas. Thus, the focus of this review can be used as a basis for a preliminary study and as a

strengthening of the academic rationale of the research because the synthesis results show that digitalization in early childhood education can only be adequately understood when it is connected to local contexts, leadership capacity, and quality governance needs. This framework will be stronger when assessment processes are treated as organizational learning that gradually and contextually improves the quality of early childhood education services.

CONCLUSION

The quality of digital governance in early childhood education can be strengthened through the integration of technology, quality assurance, adaptive leadership, and context-based governance. The screening results showed that the 13 included articles emphasized the strategic value of digitalization in early childhood education when technology is used to support quality documentation, communication with families, decision-making, and service quality improvement. However, the benefits of digitalization cannot be separated from infrastructure readiness, digital literacy, data protection, cultural sensitivity, and the ability of unit heads to manage change in a directed manner.

The adaptive leadership of unit heads becomes a connecting factor between policy, technology, teachers, families, and local needs. In rural areas, digital governance in early childhood education needs to be designed in a simple, participatory, and evidence-oriented manner so that technology does not become a new administrative burden. The most relevant model for the context of Indragiri Hulu is digital governance based on internal quality assurance, meaningful assessment, local networks, distributed leadership, and the normative commitment of unit heads to improving the quality of early childhood education services.

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