



Data Digitalization as a Strategy to Enhance Accessibility of Inclusive Education Services for Children with Special Needs

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ABSTRACT

Inclusive education is a public service that ensures every child, including children with special needs, has equal access to quality education. However, its implementation still faces barriers such as late identification, fragmented data, limited teacher support, inadequate facilities, and weak coordination among stakeholders. This article analyzes how data digitalization can strengthen inclusive education governance through a qualitative descriptive approach based on literature review and document analysis. The findings show that digitalized data can support early identification, mapping of reasonable accommodations, learning support monitoring, cross-sectoral coordination, and evidence-based policy-making. The article concludes that data digitalization is not merely an administrative innovation, but a public service transformation strategy to create more accessible, equitable, transparent, and sustainable inclusive education services.

INTRODUCTION

Inclusive education has become an important agenda in contemporary public administration because education is not only a social sector service but also a constitutional and human rights-based public service. Every child, including children with special needs, has the right to participate in education that is accessible, meaningful, safe, and supportive. UNICEF defines inclusive education as education that enables all children to learn together in the same classrooms and schools, including groups that have traditionally been excluded from education, such as children with disabilities and children from marginalized communities.

The urgency of inclusive education is closely related to global inequality in educational access. The World Bank reports that children with disabilities remain among the groups most likely to be excluded from education. Globally, children with disabilities are estimated to be 2.5 times more likely never to attend school compared with their peers, and many children with disabilities in low- and middle-income countries remain excluded from formal learning opportunities. In Indonesia, the World Bank also notes that almost 30 percent of children with disabilities do not have access to education, while many of those already enrolled are still underserved.

These facts indicate that the problem of inclusive education is not only about school enrollment. The deeper issue lies in the governance of public services: how children are identified, how their needs are recorded, how schools respond to those needs, how local governments allocate resources, and how service quality is monitored. Many inclusive education problems arise because data on children with special needs are incomplete, scattered, outdated, or not connected to service planning. Without reliable data, schools may not know how many children require learning adaptation, assistive technology, individual support, accessible facilities, or professional assessment.

Data digitalization therefore becomes a strategic issue in inclusive education governance. Digitalized data can help schools and governments move from reactive service delivery to proactive, evidence-based service delivery. Instead of waiting until children experience learning difficulties, schools can use digital data to identify needs earlier, plan reasonable accommodations, monitor learning progress, and coordinate support with parents, special education teachers, psychologists, therapists, health workers, and local government agencies.

In Indonesia, digital transformation in public services is supported by the Electronic-Based Government System, or SPBE, under Presidential Regulation No. 95 of 2018. This regulation positions information and communication technology as an instrument for providing government services to users. Indonesia also has the One Data Indonesia policy under Presidential Regulation No. 39 of 2019, which aims to produce government data that are accurate, up-to-date, integrated, accountable, and shareable between central and regional government institutions. These two policies provide an important foundation for developing digital data governance in inclusive education.

This article argues that data digitalization can enhance the accessibility of inclusive education services for children with special needs if it is implemented as part of public service transformation, not merely as technical data entry. Digitalization must be connected to inclusive values, data ethics, service integration, school capacity, and policy accountability. Therefore, the central question of this article is: **How can data digitalization become a strategy to enhance the accessibility of inclusive education services for children with special needs?**

LITERATURE REVIEW

Inclusive education is rooted in the principle that schools must adapt to the diversity of learners rather than expecting learners to adapt to rigid school systems. UNESCO's Global Education Monitoring Report 2020 emphasizes the principle of "All means all," meaning that inclusive education must address all forms of exclusion based on background, ability, disability, poverty, language, gender, location, or other conditions. In this perspective, inclusive education is not a charity program for a small group of students; it is a transformation of the education system so that every learner can participate and achieve.

As a public service, inclusive education must meet several principles: equality, accessibility, responsiveness, accountability, and non-discrimination. Children with special needs require not only access to school buildings but also access to curriculum, communication, assessment, social participation, and learning support. Accessibility therefore must be understood broadly. It includes physical accessibility, such as ramps and accessible toilets; pedagogical accessibility, such as differentiated instruction; communication accessibility, such as sign language or alternative formats; and administrative accessibility, such as simple, transparent, and responsive procedures.

In Indonesia, inclusive education policy has developed through various legal instruments. Historically, Minister of National Education Regulation No. 70 of 2009 defined inclusive education as an educational system that gives opportunities to students with disabilities and students with special intelligence or talents to learn together with other students in the same educational environment. More recently, Minister of Education, Culture, Research, and Technology Regulation No. 48 of 2023 regulates reasonable accommodation for students with disabilities across formal early childhood education, primary education, secondary education, and higher education, including support related to funding, facilities, educators, curriculum, Disability Service Units, reporting, supervision, monitoring, and evaluation.

These regulations show that inclusive education requires systematic governance. Schools cannot provide inclusive services only through goodwill. They need accurate data, trained teachers, adaptive curriculum, accessible infrastructure, cross-sectoral collaboration, and continuous evaluation. Digitalization can strengthen these governance elements by making information more visible, connected, and usable.

Data digitalization refers to the transformation of education data from manual, paper-based, fragmented, and isolated records into structured digital

information that can be stored, updated, analyzed, shared, and used for decision-making. In inclusive education, digitalized data may include student profiles, types of special needs, learning barriers, functional abilities, assessment results, required accommodations, assistive devices, teacher support, parental involvement, and progress monitoring.

UNICEF has emphasized the importance of data for monitoring education for children with disabilities. Its database on education for children with disabilities includes indicators such as attendance, out-of-school rates, completion rates, and foundational learning skills, showing that disability-related education data are crucial for SDG 4 monitoring. UNICEF and the Washington Group have also explored the use of child functioning questions in Education Management Information Systems, indicating that disability data can be integrated into national education data systems when appropriate tools and safeguards are used.

Digitalized data can enhance accessibility because it helps institutions recognize barriers more precisely. For example, if a school records that a student has a hearing impairment, the data should not stop at the label. The system should also identify the student's communication needs, classroom seating requirements, assistive devices, teacher strategies, and assessment accommodations. In this way, digital data become a bridge between identification and service response.

However, digitalization does not automatically create inclusion. If data systems only collect labels without linking them to support, they may reproduce stigma. If data are not protected, children's privacy may be violated. If teachers lack training, digital systems may become an administrative burden. Therefore, the literature on digital governance reminds public institutions that digital transformation must be human-centered, secure, ethical, and oriented toward public value.

Digital governance is not simply the use of technology in government. It is the transformation of public administration through digital systems, data integration, user-centered services, and evidence-based decision-making. The OECD explains that governments need clear objectives, skilled people, enabling tools, regulatory frameworks, and risk mitigation related to security, privacy, and inclusion when adopting digital government.

In public service innovation, the OECD also emphasizes that governments are increasingly moving toward human-centered public services, including co-design with users and stakeholders to create flexible, responsive, resilient, and sustainable services. This idea is highly relevant to inclusive education because children with special needs, parents, teachers, and support professionals should not be treated merely as data objects. They should be involved as service users whose experiences inform system design.

From the perspective of public value governance, the success of digitalization should not be measured only by the number of records uploaded or the speed of data processing. It should be measured by whether data improve children's access to services, reduce exclusion, help teachers respond better, guide fair resource allocation, and increase public trust. Thus, data digitalization

in inclusive education must be evaluated based on public value: justice, dignity, participation, transparency, and improved learning outcomes.

The development of inclusive education data systems faces several challenges. First, there is often no standardized definition or classification of children with special needs across institutions. Schools may use different categories, health services may use clinical categories, and social services may use administrative categories. This can create inconsistency and duplication.

Second, data are frequently fragmented. A child's school record, health assessment, social assistance status, and learning support plan may be stored in different systems that do not communicate with one another. As a result, parents must repeatedly submit similar documents, and schools may lack complete information.

Third, there are ethical concerns. Data on disability and special needs are sensitive. If not properly protected, such data can expose children to stigma, discrimination, or misuse. Therefore, digital systems must include consent mechanisms, access control, anonymization for reporting, and clear rules on who can view or update information.

Fourth, there is a capacity gap. Teachers and school administrators may be asked to use digital systems without sufficient training. If digitalization is designed only as bureaucratic reporting, it may increase workload without improving services. The system must therefore be simple, useful, and directly connected to school-level decision-making.

METHODOLOGY

This article uses a qualitative descriptive approach with library research and document analysis. The purpose of this method is to build a conceptual understanding of how data digitalization can enhance the accessibility of inclusive education services for children with special needs. This article does not present field survey results. Instead, it synthesizes relevant literature, policy documents, and institutional reports to formulate analytical findings and recommendations.

The data sources include international reports on inclusive education and disability, public service and digital governance literature, Indonesian regulations on digital government and inclusive education, and relevant institutional documents from UNESCO, UNICEF, the World Bank, OECD, and Indonesian government legal databases. These documents were selected because they provide authoritative perspectives on inclusive education, disability data, public service transformation, and digital governance.

The analysis was conducted through thematic interpretation. The documents were read and categorized into several themes: inclusive education as a public service, accessibility barriers for children with special needs, the function of digital data in education governance, digital public service principles, ethical risks, and implementation requirements. The themes were then connected to generate findings about how digitalization can function as a strategy for improving inclusive education accessibility.

Because this is a conceptual qualitative article, the findings should be understood as analytical propositions. They can be developed further through empirical research, such as interviews with school principals, inclusive education teachers, parents, local education officers, and children with special needs.

RESULT AND DISCUSSION

The first finding is that digitalized data can strengthen early identification. In many schools, children's special needs are identified late because records are incomplete or because teachers lack systematic tools to document learning barriers. A digital system can help schools record observations, screening results, parental information, and recommendations from professionals. This enables schools to recognize children's needs earlier and design support before learning difficulties become more severe.

The second finding is that data digitalization can support the mapping of reasonable accommodation. Reasonable accommodation refers to adjustments that allow children with disabilities or special needs to access learning on an equal basis. In the Indonesian regulatory context, reasonable accommodation is explicitly addressed in Ministerial Regulation No. 48 of 2023, which covers support related to funding, facilities, educators, curriculum, Disability Service Units, and monitoring. A digital data system can help schools identify what accommodations are required, whether they are available, and which students remain underserved.

The third finding is that digitalized data can improve coordination among stakeholders. Inclusive education involves multiple actors: classroom teachers, special education teachers, school principals, parents, local education offices, psychologists, health workers, therapists, and social services. Without integrated data, coordination is slow and repetitive. Digital platforms can reduce fragmentation by creating shared service records, while still protecting privacy through role-based access.

The fourth finding is that digitalization supports evidence-based policy. Local governments need accurate data to decide where to allocate inclusive education budgets, which schools require facility improvements, how many teachers need training, and what kinds of assistive technologies are needed. One Data Indonesia provides a national policy foundation for accurate, updated, integrated, accountable, and shareable government data. In inclusive education, this principle can guide the development of integrated data that links school-level needs with local planning and budgeting.

The fifth finding is that digital systems can strengthen monitoring and accountability. Inclusive education should not end with enrollment. Children with special needs must be monitored in terms of attendance, participation, learning progress, social inclusion, and access to support. Digital dashboards can help schools and governments identify gaps, such as students who are enrolled but not receiving support, schools without trained teachers, or facilities that remain inaccessible.

The sixth finding is that digitalization also creates risks. Sensitive data about children's disabilities, learning difficulties, or psychological conditions

must be protected. Data systems may create stigma if children are categorized in rigid or deficit-based ways. They may also exclude children further if families have limited digital literacy or if schools lack infrastructure. Therefore, digitalization must be accompanied by data protection, inclusive language, user training, and accessible system design.

The findings show that data digitalization can become a strategic instrument for transforming inclusive education services. However, its success depends on whether digitalization is understood as a governance reform rather than a technical project. Inclusive education requires data that are meaningful, ethical, and connected to action.

First, digitalization must shift the focus from “counting children” to “serving children.” Many data systems are designed primarily for reporting. They record numbers of students with special needs but do not explain what services each child requires. A more inclusive system should connect student data with service plans. For example, if a student is identified as having low vision, the system should help schools plan large-print materials, seating arrangements, lighting adjustments, assistive technology, and teacher support.

Second, digital systems must support teachers rather than burden them. Teachers are central actors in inclusive education. If the digital platform is complicated, repetitive, or disconnected from classroom practice, teachers may see it as additional bureaucracy. Therefore, the system should provide practical functions: student profiles, learning adaptation notes, progress records, accommodation checklists, referral forms, and communication channels with parents.

Third, digitalization should support collaborative governance. Inclusive education cannot be managed by schools alone. The New Public Governance perspective emphasizes collaboration among government, communities, families, and professional actors. Digital data can become a shared platform for collaboration, but only if institutions agree on roles, responsibilities, and data-sharing protocols.

Fourth, data digitalization must be aligned with public value. In public service terms, the ultimate goal is not technological sophistication but improved accessibility and justice. A digital system is valuable if it helps children enter school, participate in learning, receive support, and develop their potential. It is not valuable if it only produces statistical reports without changing service delivery.

Fifth, digitalization must be inclusive in its own design. A system intended to support accessibility should itself be accessible. It should be usable by school staff with different levels of digital competence, understandable for parents, and compatible with assistive technologies. It should also avoid discriminatory language. The category “children with special needs” should not become a label that limits expectations. Instead, the system should emphasize functional needs, support strategies, and children’s strengths.

Finally, digitalization requires strong governance. This includes data standards, interoperability, privacy protection, training, funding, technical support, and evaluation. SPBE and One Data Indonesia provide a policy

foundation, but implementation at the school and local government level requires institutional commitment. Digitalization must be integrated into inclusive education planning, not treated as a separate administrative application.

CONCLUSIONS AND RECOMMENDATIONS

Data digitalization is a strategic approach to enhance the accessibility of inclusive education services for children with special needs. It can support early identification, mapping of reasonable accommodation, cross-sectoral coordination, evidence-based policy, monitoring, and accountability. However, digitalization must be guided by inclusive values, ethical data governance, public service orientation, and human-centered design.

The main conclusion of this article is that digital data should function as a bridge between children's needs and public service responses. When properly designed, digitalization can help schools and governments provide services that are more accurate, responsive, equitable, and sustainable. When poorly designed, it can become a bureaucratic burden or even a source of stigma and exclusion.

Several recommendations can be proposed. First, local governments and schools should develop integrated inclusive education databases that record not only student categories but also functional needs, accommodations, support services, and progress. Second, data systems should be connected to planning and budgeting so that information on children with special needs directly informs teacher training, facility improvement, assistive technology provision, and specialist support. Third, teachers and school administrators should receive training in both digital data management and inclusive education practice. Fourth, data protection mechanisms must be strengthened to ensure confidentiality, consent, and ethical use of sensitive information. Fifth, parents and children should be involved in designing and evaluating digital systems so that the system reflects real accessibility needs. Sixth, digitalization should be aligned with national policies on SPBE, One Data Indonesia, and reasonable accommodation for students with disabilities.

In the future, empirical research is needed to examine how schools actually collect, manage, and use data on children with special needs. Further studies may involve interviews with teachers, parents, school principals, education officers, and children themselves. Such research would provide deeper insight into the practical challenges and opportunities of digital data governance in inclusive education.

FURTHER STUDY

Further research on data digitalization in inclusive education should move beyond conceptual analysis and focus on empirical investigation in schools and local government institutions. Advanced research may examine how digital data systems are designed, implemented, and used by schools to identify, support, and monitor children with special needs. This is important because the success of digitalization does not only depend on technological availability, but

also on institutional readiness, teacher competence, data accuracy, ethical governance, and collaboration among stakeholders.

Future studies may use a case study approach in inclusive elementary schools to explore how teachers, school principals, parents, and local education officers collect and use data on children with special needs. Through interviews, observations, and document analysis, researchers can identify whether digital data truly improves service accessibility or merely becomes an administrative requirement. Such research can also reveal practical barriers, such as limited digital literacy, inadequate infrastructure, unclear data standards, lack of teacher training, and weak integration between education, health, and social service data. In addition, advanced research can develop a digital governance model for inclusive education services. This model may include several key components: student needs identification, reasonable accommodation mapping, individual learning support records, teacher support systems, parental participation, cross-sectoral referral mechanisms, data protection protocols, and policy monitoring dashboards. By developing such a model, research can contribute not only to academic knowledge but also to practical policy innovation in inclusive education.

Another important area for advanced research is the ethical dimension of data digitalization. Data on children with special needs are sensitive and must be protected from misuse, stigma, and discrimination. Therefore, future studies should examine how schools and governments ensure data privacy, informed consent, role-based access, and responsible data sharing. This ethical perspective is essential to ensure that digitalization supports inclusion rather than creating new forms of exclusion.

Finally, advanced research may evaluate the impact of digitalized data on public service quality. Indicators may include faster identification of children's needs, improved availability of reasonable accommodations, better teacher responsiveness, stronger parental involvement, more accurate budget allocation, and increased transparency in inclusive education governance. Through this approach, digitalization can be assessed not only as a technological innovation, but as a strategy for transforming public services toward greater equity, accessibility, accountability, and sustainability.

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