Enhancing School Digital Capabilities through Digitalization Programs

Mia Olvy Andari[1], Dani Hermawan[2], Ahmad Royani[3]

miaolvy99@gmail.com[1],dani_0z@uinkhas.ac.id[2], royanpuritanjung@gmail.com[3]

Universitas Islam Negeri Kiai Haji Achmad Siddiq Jember, Indonesia[1], Universitas Islam Negeri Kiai Haji Achmad Siddiq Jember, Indonesia[2], Universitas Islam Negeri Kiai Haji Achmad Siddiq Jember, Indonesia[3].

Abstract. The digitalization of education is pivotal in the 4.0 and 5.0 eras, fostering equitable access to information and improving learning processes in a globally competitive environment. This study evaluates the implementation and impact of the *Si Remote* digitalization program at a junior high school in Indonesia. The research combines qualitative data from interviews, observations, and documentation with quantitative survey data to assess features such as *E-Class Management* and *E-Special Services Management*. Key findings highlight the program's effectiveness in streamlining school administration, enhancing teaching efficiency, and increasing student engagement. Notable initiatives include *E-Attendance*, *E-Budgeting*, *E-Library*, and *E-Canteen*, simplifying processes and improving access to resources. Despite these successes, challenges such as the digital divide and technical issues persist, emphasizing the need for improved infrastructure and training. This study offers valuable insights for replicating digitalization efforts in similar educational contexts, contributing to inclusive and innovative school management.

Keywords: educational digitalization, digital literacy, school administration technology

1 Introduction

The digitalization of education has emerged as a transformative force in the 4.0 and 5.0 eras, characterized by rapid technological advancements and societal shifts driven by digital innovations. These eras emphasize the integration of intelligent technologies, such as artificial intelligence (AI), big data, and the Internet of Things (IoT), to revolutionize traditional practices across sectors, including education[1][2]. Since the 1980s, the digital era has progressively evolved, marking a shift from mechanical and analog systems to digital technologies[3], significantly reshaping various sectors, including education [4]. This digital transformation prepares students for the demands of a technologically advanced workforce[5] and addresses the evolving needs of modern society[6] by emphasizing collaboration, creativity, and critical thinking skills.

ACIE 2024, October 14-15, Jember, Indonesia

DOI 10.4108/eai.14-10-2024.2354652

Digitalization in education is particularly crucial for enhancing access to information[7], improving teaching and learning processes[8], and preparing students for a globally competitive environment[9]. This shift integrates tools such as computers, smartphones, and multimedia technologies to establish a student-centered learning ecosystem[10], fostering collaboration[11], critical thinking[12], and the exchange of ideas[13].

The government's commitment to digital transformation in Indonesia is reflected in key policies, including Presidential Instruction No. 95 of 2018 on the e-Government System. This directive emphasizes leveraging digital technologies to improve the quality of public services[14], with education being a central focus. Programs initiated by the Ministry of Education and Culture, such as digitalized textbooks, e-learning platforms, and online assessments, aim to bridge educational disparities between urban and rural areas[15] while modernizing the teaching and learning processes. These efforts align with the broader goals of the industrial revolutions, promoting equitable access to resources[16] and preparing students to navigate the challenges of globalization.

Despite these advancements, implementing educational digitalization in Indonesia remains uneven[17], particularly in rural areas where infrastructure, training, and resources are limited[18]. These disparities create a digital divide[19], restricting access to innovative tools and exacerbating educational inequalities. Addressing this issue, a junior high school in Banyuwangi, Indonesia, stands out as a model institution implementing a comprehensive digitalization program called *Si Remote*. This initiative encompasses features like *E-Class Management*, *E-BK* (Guidance Counseling), and *E-Canteen*, which streamline administrative processes and enhance educational experiences. However, systematic evaluations of its impact on student engagement, school management, and service delivery remain limited.

This research aims to evaluate the implementation and outcomes of the *Si Remote* digitalization program at the junior high school, focusing on its effectiveness in improving school management, fostering student engagement, and optimizing service delivery. This study combines qualitative data from interviews, observations, and documentation with quantitative survey data to comprehensively understand the program's impact.

The findings are expected to contribute to the broader discourse on digitalization in education by addressing gaps in the literature on rural school initiatives. Academically, the research provides insights into the practical challenges and successes of implementing digital tools in education. Practically, it offers actionable recommendations for policymakers and educators to replicate and adapt similar programs, ensuring a more inclusive and practical framework for digitalization in Indonesian schools.

2 Method

The researcher employs a Mixed Methods approach [20]. This research adopts a mixed methods approach, integrating qualitative and quantitative methodologies to understand the phenomenon studied comprehensively. The mixed methods approach used in this study is the Sequential Exploratory Design model. The Sequential Exploratory Design is the chosen model, involving a step-by-step process where qualitative research is conducted first, followed by quantitative research. This research model combines qualitative and quantitative methods in a sequential

(serial) order, where the first phase of the research uses qualitative methods and the second phase uses quantitative methods. In the qualitative phase, data is gathered through observations, interviews, and documentation to explore underlying themes and insights. The subsequent quantitative phase involves surveys or statistical analysis to validate and generalize the findings from the qualitative phase. This combination ensures a robust research framework, allowing for in-depth exploration and data-driven conclusions that enhance the study's reliability and applicability.

The researcher uses source and technique triangulation to test the validity of qualitative data.

2.1 Source Triangulation

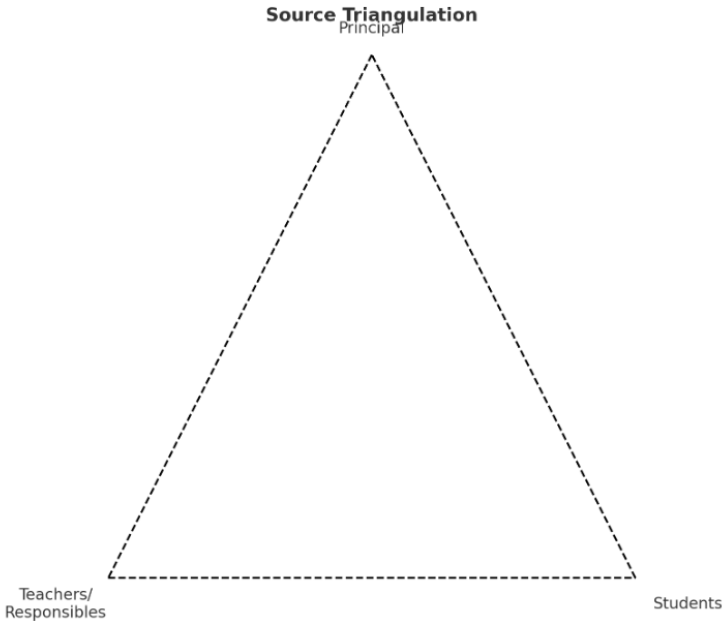

Figure 1. Source Triangulation

Source triangulation ensures data credibility by comparing information gathered from multiple sources using the same method. This approach helps identify consistent patterns and reduces the potential for bias from a single perspective. In this research, the researcher chooses three key informants: the Principal, who provides insights into policy and administrative aspects; Teachers/Responsible, who offer perspectives on implementation and challenges; and Students, who share experiences and outcomes from using digitalization programs. Comparing data from these varied perspectives strengthens the study's validity and reliability.

2.2 Technique Triangulation

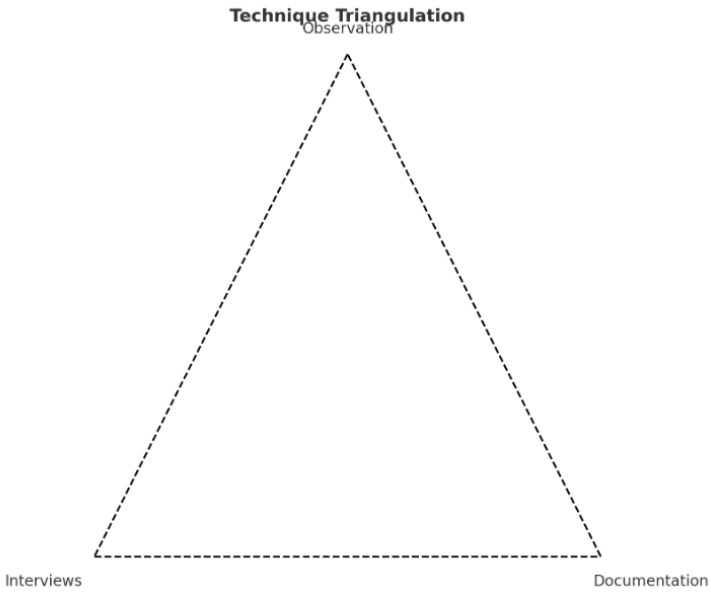

Figure 2. Technique Triangulation

Technique triangulation focuses on verifying data credibility by employing multiple data collection methods on the same source. This approach enhances understanding by capturing diverse aspects of the data. In this study, the researcher employs three techniques:

a. *Observation*: Directly monitoring activities and behaviors to gather firsthand insights.
b. *Interviews*: Engaging in structured conversations to explore more profound experiences and perceptions.
c. *Documentation*: Analyzing records, such as reports, attendance logs, or digital platform data, to substantiate findings from observations and interviews.

By cross-referencing data collected through these techniques, the researcher ensures a thorough analysis.

Combining source and technique triangulation creates a robust framework for validating qualitative data. The researcher minimizes errors, inconsistencies, and biases by gathering insights from different informants (source triangulation) and through various methods (technique triangulation). This dual triangulation approach provides a well-rounded perspective, uncovering nuanced insights about the digitalization program's implementation and outcomes. Triangulation is vital for enhancing the credibility and dependability of qualitative research findings. It ensures that the data reflects diverse viewpoints and withstands scrutiny from multiple angles. In this study, triangulation validates the findings and highlights the challenges, successes, and areas for improvement in the digitalization program, offering a balanced and reliable conclusion.

Then, the researcher utilized validity and reliability tests to examine the accuracy of quantitative data.

a. Validity Test

   The validity test is used to evaluate the questionnaire developed by the researcher to determine whether it is valid. A questionnaire is considered valid if its questions and content accurately measure what they are intended to assess. The data obtained from the trial questionnaire will be tested for validity using SPSS, and the results will be compared with the r-table at a 5% significance level. The instrument is considered invalid if the r-table value exceeds the r-calculated value. Based on the validity test conducted on the questionnaire responses, which involved eight respondents from User Group 1 (teachers/responsible) and 24 respondents from User Group 2 (students), the r-table value was determined to be 0.444. The questionnaire is deemed valid if the r-table value (0.444) exceeds the r-calculated value. The final results of the validity test for the eight respondents in User Group 1 (teachers/responsible) showed that all items were valid.

b. Reliability Test

   The reliability test is used in research to ensure that the information obtained is consistent, even when measured using the same instrument multiple times. This study employed the Cronbach's Alpha method, where the instrument is considered reliable if Cronbach's Alpha is more incredible than the r-table value at a 5% significance level. The reliability coefficient (α) is deemed acceptable if greater than 0.60.

3 Results

This study's combination of qualitative and quantitative data has provided a comprehensive understanding of the digitalization program. The qualitative phase revealed strong support for the program from teachers and students, with many expressing satisfaction with the tools' ease of use and accessibility. However, the challenges related to initial adaptation and limited resources highlighted areas for improvement. The quantitative phase confirmed that the digital tools were well-received, significantly improving efficiency and student engagement.

3.1. Implementation of the Digitalization Program

Based on the interview and documentation techniques, it was found that digitalization was implemented by creating various programs to facilitate school services and management, known as *Si Remote*. Some of the programs created for school management include the following*:*

E-Class Management

E-Class management is a website or QR barcode students or teachers use to facilitate class management in a digital format. Below are the digitalization programs for e-class management.

a. *E-Attendance*: E-Attendance involves the class secretary accessing the *E-Class Management* website, selecting the *E-Attendance* menu, and checking the names of classmates who are present or absent. Attendance records are automatically compiled and displayed directly on the spreadsheet in the *E-Attendance* system.

b. *E-Budgeting*: The class treasurer records and reports class administration through the E-Class Management website. They select the E-Budgeting menu in a spreadsheet and manual (ledger) format. The records are updated twice a week.
c. *E-Learning Journal*: The class secretary fills the journal through the E-Class Management website. They select the E-Learning Journal menu, which includes information such as the lesson time, the teacher, and the subject matter taught.
d. *E-Pancasila Student Journal*: The class secretary records student behavior through the E-Class Management website by selecting the E-Pancasila Student Journal menu. This journal notes actions or behaviors that do not align with the values of Pancasila (Indonesia's national ideology).
e. LIKABUM (Student Needs Information Sheet). Students fill out their personal data through the e-Class Management website and then select the LIKABUM menu option, accompanied by their parents. That includes interests, hobbies, learning preferences, student abilities, competencies, supporting information, and career aspirations. LIKABUM aims to align students' learning styles in the classroom and make it easier for teachers to manage the learning process.
f. *E-Journal Reflection for Students*. Using the e-journal reflection, each student individually fills out their learning achievements through the e-Class Management website, selects the e-journal reflection feature, and fills out a Google Form containing questions about their learning success. These questions include their level of happiness in class/school, what makes them happy at school, what makes them unhappy at school, and sharing positive and negative experiences in school, among others. The e-journal reflection allows teachers to assess and analyze whether the learning process has been successful, not by measuring the competency achievements of the students but by evaluating the success of the learning process for both students and teachers.

E-Special Services Management

The digitalization program incorporates several features designed to improve various school services. The *E-BK (Guidance and Counseling)* feature includes video guidance from YouTube and counseling services through WhatsApp chat, making it easier for students to receive support. The *E-Kantin* (Canteen) provides a digital menu of food, drinks, and snacks, all available on the website, with the added convenience of ordering via WhatsApp. The *E-Lab PAI* (Islamic Education Laboratory service) offers numerous features accessible through the website, such as a guest book, profiles, background information, vision, mission, learning media, e-books, schedules, and an activity gallery, helping to streamline administration and enhance learning. The *E-Perpus* (E-Library) includes features like the visit book, cheerful library ambassador program, articles, curriculum books, bulletins, book collections, and a gallery of library activities, all available online for easy access. The *E-UKS* (School Health Services) provides health education through YouTube videos and health services via WhatsApp and promotes a healthy school environment through digital resources. Finally, *E-Ijen Geopark* provides detailed information on the geopark's concept, geology, biology, cultural sites, and legal framework, all accessible through the website. These features aim to streamline services, enhance communication, and provide easier access to information and resources for both students and staff.

3.2. User Response to the Digitalization Program

E-Class Management

Based on the survey results from two user groups, group 1 (Teachers/Responsibles) and group 2 (Students), regarding the features of e-class management such as E-Attendance, E-Budgeting, E-Learning Journal, E-Pancasila Student Journal, Likabum, and E-Student Reflection Journal, 70% of them felt that these features were easy to use. That means that most users find the e-class management system easy to understand and use. It can be shown below.

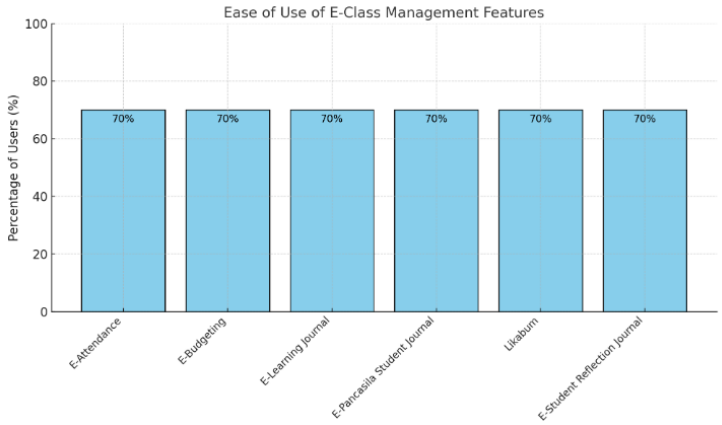

Figure 3. E-Class Management

E-Special Services Management

Based on the survey results conducted with two user groups, Group 1 (Teachers/Responsibles) and Group 2 (Students), it was found that the specialized E-Management system features, such as *E-BK*, *E-Canteen*, *E-Lab PAI*, *E-Library*, *E-UKS*, and *E-Ijen Geopark*, were reported to be easy to use. With 75% of students and teachers feeling that these E-Class Management features are user-friendly, according to the Likert scale assessment, most users feel comfortable and do not face difficulties using these features. It can be shown below.

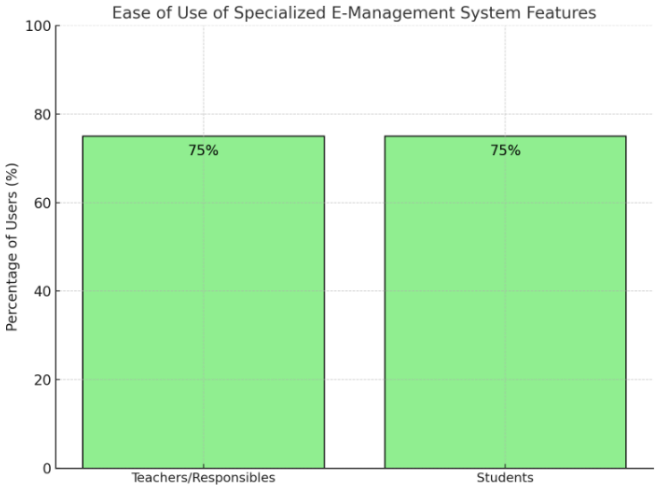

Figure 4. E-Special Services Management

4 Discussion

4.1 Implementation of the Digitalization Program

The digitalization program, *Si Remote*, was implemented as a comprehensive initiative to modernize school management and improve service delivery. This program introduced several innovative features designed to streamline administrative processes and enhance educational experiences for both teachers and students. One of its key components, *E-Class Management*, included tools such as *E-Attendance*, *E-Budgeting*, and *E-Learning Journal*. These tools automated processes such as tracking student attendance, managing school finances, and maintaining real-time learning records. This automation significantly reduced the administrative burden on educators and staff, enabling them to allocate more time and energy to instructional and developmental tasks[21], [22].

In addition to classroom-focused tools, the program incorporated E-Special Services Management, which included features such as *E-BK (Guidance and Counseling)*, *E-Kantin (Canteen)*, and *E-Library*. These specialized services provided students and teachers seamless access to essential school resources. For instance, *E-BK* streamlined communication between counselors and students, offering a more structured and accessible way for students to receive counseling support. Similarly, *E-Kantin* introduced a cashless transaction system for ordering food, which enhanced operational efficiency and promoted convenience for students and staff. The *E-Library* enabled digital access to learning materials, reducing reliance on physical textbooks and fostering a more inclusive and resource-rich educational environment.

Implementing *Si Remote* underscores the school's commitment to leveraging technology to address operational inefficiencies. By automating routine tasks and introducing digital platforms, the program not only improved day-to-day school operations[23][24] but also set the stage for increased engagement among students and teachers[25]. These advancements demonstrate the potential of technology to revolutionize educational management when thoughtfully designed and implemented. The program's success highlights the importance of combining user-friendly tools with robust support systems to ensure widespread adoption and sustained use.

The digitalization program also enhanced the accessibility of various school services for students and teachers. Features such as *E-BK*, which utilized platforms like WhatsApp for communication, and *E-Kantin*, which allowed for menu ordering, were particularly effective in improving interactions within the school community. Students noted that these tools helped them feel more connected to their peers and teachers, creating a stronger sense of belonging within the school. Furthermore, the flexibility offered by the digital platforms, such as ordering food or accessing counseling support remotely, empowered students to engage with school services[26] in ways that aligned with their individual needs and preferences.

4.2 User Perception and Usability

The teachers and students expressed high satisfaction with the digital tools used in class management and unique services. Features such as *E-Attendance*, *E-Budgeting*, and *E-Learning Journals* were particularly valued for their ability to streamline daily administrative tasks and create a more organized, transparent system. Teachers found these tools instrumental in reducing the time spent on routine tasks, enabling them to focus more on teaching. Similarly,

students appreciated the ease of navigating these systems, which helped them stay informed and actively participate in classroom activities. This functionality alignment with user needs underscores these tools' effectiveness in addressing modern education's demands.

In the second stage of the research, quantitative data was collected through surveys administered to teachers and students. Survey results revealed that 70% of respondents rated the digital tools used for class management as "easy to use" and "helpful in daily tasks." *E-Attendance* and *E-Budgeting* received exceptionally high ratings for their efficiency and time-saving capabilities. Teachers noted that E-Attendance provided real-time tracking of student participation, while E-Budgeting simplified the planning and monitoring of classroom expenses. These features enhanced operational efficiency and created a more systematic and transparent classroom environment.

Teachers and students also highly rated the E-Special Services Management program features, such as *E-BK*, *E-Kantin*, and *E-Perpus*. Approximately 75% of participants indicated that these tools significantly improved communication facilitated more efficient school services, and provided better access to resources. For instance, E-Kantin streamlined the ordering and payment process for meals, while *E-Perpus* offered a digital library platform that expanded access to learning materials. These tools fostered a more cohesive and connected educational environment, bridging the gap between students and services.

The findings indicate that the digitalization program has successfully improved classroom and service management, enhanced accessibility to educational resources, and strengthened communication between students and teachers. As Didmanidze et al. found, by simplifying complex processes, digital technologies enabled educators to focus more on teaching and mentoring[27], while students benefited from a more engaging and supportive educational experience.

The results demonstrate that *Si Remote* effectively streamlined administrative processes and optimized educational services. The program's features addressed critical operational inefficiencies, reducing the burden on staff and improving the overall educational experience for students. These findings underline the importance of aligning technological tools with schools' practical needs to achieve meaningful improvements in educational outcomes[28].

4.3 Enhanced Engagement and Accessibility

When asked about the impact of the digitalization program on their learning experience, over 70% of students reported that the digital tools, particularly *E-Learning Journals* and *E-Journal* Reflections, significantly enhanced their engagement with the content and allowed them to reflect on their learning progress. These tools provided an intuitive platform for students to systematically document and track their achievements. Many students noted that this process made them more aware of their educational growth, fostering a sense of accomplishment and motivating them to take greater responsibility for their learning. This feedback highlights the role of digital tools in promoting self-directed learning, a key element of modern educational practices.

Administrators and teachers similarly valued digital management tools for improving organizational efficiency within the school. Tools such as *E-Attendance*, *E-Budgeting*, and *E-Journals* were widely recognized as a significant improvement over traditional paper-based

methods. The capability to perform real-time data entry and reporting reduced the likelihood of errors and minimized delays in administrative processes. Teachers, in particular, found the *E-Learning Journal* beneficial for monitoring student progress, allowing for timely feedback and better alignment of teaching strategies with student needs. These advancements underline the importance of technology in optimizing school management and fostering a more dynamic and responsive educational environment.

Digital tools also played a critical role in enhancing student engagement and fostering a deeper connection to school activities. Features like *E-Journal Reflections* allowed students to record their personal experiences and insights, encouraging them to participate actively in their educational journey. This functionality helped build a sense of accountability and ownership among students, aligning with best practices in student-centered learning. Teachers observed that this feature enabled students to reflect critically, contributing a more thoughtful approach to their studies and school life.

Overall, the digitalization program improved administrative efficiency[23] and contributed to better educational outcomes by encouraging active learning and self-assessment among students. This dual impact reflects a growing alignment with global trends in digital education[29], emphasizing technology's importance in fostering collaborative, interactive, and student-driven learning environments. By bridging administrative and pedagogical goals, the program serves as a model for integrating digital tools into educational systems effectively.

4.4 Challenges in Implementing *Si Remote*

Despite the successes of the *Si Remote* program, several challenges were identified during its implementation. These challenges reveal systemic issues that must be addressed for the program to achieve its full potential and ensure equitable benefits for all stakeholders.

4.4.1 Digital Divide

One of the most significant challenges was the digital divide, particularly among students in rural areas. Limited device access and unreliable internet connectivity prevented some students from fully participating in the program. Students from low-income families were disproportionately affected, highlighting the socioeconomic inequalities that persist in education. This inequity in access created disparities in engagement and learning outcomes, emphasizing the need for targeted infrastructural improvements to bridge the gap[30].

4.4.2 Learning Curve and Overdependence on Technology

The transition to digital platforms posed challenges for both students and teachers. Approximately 30% of respondents indicated additional training was needed to utilize the program's digital tools fully. Teachers highlighted a steep learning curve, particularly for those unfamiliar with online teaching platforms. Workshops and ongoing support were identified as critical for helping educators navigate these challenges and integrate digital tools into their teaching practices effectively[31]. Moreover, some teachers expressed concerns about balancing traditional teaching responsibilities with the demands of managing digital tools, leading to increased workloads and, in some cases, burnout.

4.4.3 Technical and Operational Issues

Frequent system glitches, downtimes, and errors in features like *E-Journal* and online menu ordering disrupted the program's smooth operation. These issues led to delays in tracking attendance, updating learning progress, and communicating through digital platforms. Teachers and students reported frustrations with these disruptions, occasionally hindering their ability to benefit entirely from the system. The reliance on technology also made schools vulnerable to operational disruptions caused by system failures or software bugs.

4.4.4 Privacy and Data Security Risks

The shift to digital platforms introduced concerns about the security of sensitive data, such as attendance records and financial information. While convenient, the use of WhatsApp for counseling raised questions about the confidentiality of student information[32], [33]. Administrators expressed concerns about the adequacy of existing measures to protect data from breaches or unauthorized access, underscoring the importance of implementing robust cybersecurity protocols.

Despite the challenges, the *Si Remote* program presents valuable opportunities to improve educational digitalization. Its success in streamlining administrative processes and enhancing student engagement demonstrates the potential for digital tools to transform education. This initiative highlights the importance of leveraging technology to foster inclusivity[34], improve learning outcomes[35], and reduce operational inefficiencies[23]. The program sets a benchmark for integrating digital platforms into school management, offering a scalable model that can be adapted to other schools across Indonesia, provided infrastructure and training are adequately addressed.

Targeted interventions are essential to overcome existing barriers. Bridging the digital divide requires expanding internet access in rural areas and providing affordable devices to ensure equitable participation. Capacity-building initiatives, such as comprehensive teacher training and peer mentoring, are crucial to equip educators with the skills to integrate digital tools effectively. Addressing technical issues through robust infrastructure, regular system maintenance, and user feedback mechanisms can enhance reliability and minimize disruptions. Moreover, implementing strong data security protocols, such as encryption and secure platforms, will help mitigate privacy concerns and build trust among users. These efforts will effectively scale digitalization programs across diverse educational contexts if it combined with a systemic approach to resource distribution and stakeholder readiness.

5 Conclusion

Implementing the *Si Remote* program has demonstrated significant potential in transforming school management and educational practices through digital innovation. The program streamlined administrative processes, enhanced student engagement, and improved service delivery by integrating tools such as *E-Class Management* and *E-Special Services Management*. Features like *E-Attendance*, *E-Budgeting*, and *E-Journal* Reflections reduced operational inefficiencies and fostered a more inclusive and resource-rich learning environment, contributing to better educational outcomes.

Despite these successes, the study highlighted critical challenges, including the digital divide, technical and privacy issues, and the steep learning curve educators and students face. Limited

device access and unreliable internet connectivity posed significant barriers, particularly for rural and low-income students. Additionally, the reliance on digital platforms underscored the need for robust infrastructure, comprehensive training programs, and stronger data security measures to sustain the program's effectiveness and ensure equitable participation.

This research provides valuable insights into the opportunities and obstacles of educational digitalization in Indonesia, offering a scalable model for other schools. However, the success of similar initiatives requires targeted interventions, such as expanding internet access, subsidizing technology for underprivileged communities, and fostering digital literacy among stakeholders. Policymakers and educators must address these systemic challenges to align digitalization efforts with national education goals.

Ultimately, the findings underscore the transformative potential of digital tools in education, emphasizing their role in fostering active learning, self-assessment, and collaborative engagement. By bridging the gap between policy aspirations and on-the-ground realities, programs like Si Remote can serve as a blueprint for achieving a more inclusive and digitally empowered education system.

Acknowledgments.

The authors would like to express their deepest gratitude to the entire ACIE 2024 committee at the Faculty of Tarbiyah and Teacher Training, UIN Kiai Haji Achmad Siddiq Jember, for their hard work in successfully organizing this event. They also thank the editors and journal managers at EUDL for their support and cooperation in publishing this article. May this contribution bring significant benefits to the advancement of knowledge.

References

[1] Lekhika, K. Taneja, and H. Taneja, "Adapting Artificial Intelligence in Teaching Learning Process: Recent Trends and Challenges," *Int. J. Eng. Sci. Humanit.*, vol. 14, no. 1, pp. 47–57, 2024, doi: https://doi.org/10.62904/v9fhpg68.

[2] M. M. Kamruzzaman *et al.*, "AI- and IoT-Assisted Sustainable Education Systems during Pandemics, such as COVID-19, for Smart Cities," *Sustainability*, vol. 15, no. 8354. pp. 1–17, 2023, doi: 10.3390/su15108354.

[3] M. Hilbert, "Digital technology and social change: the digital transformation of society from a historical perspective," *Dialogues Clin. Neurosci.*, vol. 22, no. 2, pp. 189–194, Jun. 2020, doi: 10.31887/DCNS.2020.22.2/mhilbert.

[4] A. Haleem, M. Javaid, M. A. Qadri, and R. Suman, "Understanding the role of digital technologies in education: A review," *Sustain. Oper. Comput.*, vol. 3, pp. 275–285, 2022, doi: https://doi.org/10.1016/j.susoc.2022.05.004.

[5] S. Kamsker, G. Janschitz, and S. Monitzer, "Digital Transformation and Higher Education: A Survey on the Digital Competencies of Learners to Develop Higher Education Teaching," *Int. J. Bus. Educ.*, no. 160, pp. 22–41, 2020.

[6] N. V Morze and O. V Strutynska, "Digital transformation in society: key aspects for model development," *J. Phys. Conf. Ser.*, vol. 1946, no. 1, p. 12021, 2021, doi: 10.1088/1742-6596/1946/1/012021.

[7] P. Yadav and A. R. Srivastava, "Digitalization in Higher Education: Students' Issues and Challenges," in *Digitalization of Higher Education using Cloud Computing*, 1st ed., New York: Chapman and Hall/CRC, 2021.

[8] R. M. F. Lima *et al.*, “Digital education: new paradigms for teaching,” *Cuad. Educ. Y Desarro.*, vol. 16, no. 2, p. e3307, 2024, doi: https://doi.org/10.55905/cuadv16n2-015.
[9] E. Yupeni, “Embracing Digitalization: Transforming Education for The 5.0 Era,” 2024, doi: https://doi.org/10.32672/pice.v2i1.1427.
[10] M. I. Pardo-Baldoví, Á. S. Martín-Alonso, and J. Peirats-Chacón, “The Smart Classroom: Learning Challenges in the Digital Ecosystem,” *Educ. Sci.*, vol. 13, p. 662, 2023, doi: https://doi.org/10.3390/educsci13070662.
[11] S. Burns *et al.*, “Navigating technology in the classroom: a scoping review of technology use during peer collaboration in early educational settings,” *Educ. Rev.*, vol. 76, no. 7, pp. 2063–2089, Nov. 2024, doi: 10.1080/00131911.2024.2336970.
[12] M. Mejia and J. M. Sargent, “Leveraging Technology to Develop Students’ Critical Thinking Skills,” *J. Educ. Technol. Syst.*, vol. 51, no. 4, pp. 393–418, May 2023, doi: 10.1177/00472395231166613.
[13] K. Neumann and N. Waight, “The digitalization of science education: Déjà vu all over again?,” *J. Res. Sci. Teach.*, vol. 57, no. 9, pp. 1519–1528, Nov. 2020, doi: https://doi.org/10.1002/tea.21668.
[14] S. Atmaja, “Pemanfaatan Artificial Intelligence (AI) Dalam Transformasi Digital Untuk Pelayanan Publik,” *J. Manaj. dan Bisnis*, vol. 6, no. 1, pp. 9–21, Mar. 2024, doi: 10.47080/jmb.v6i1.3233.
[15] N. Bianchi, Y. Lu, and H. Song, “The Effect of Computer-Assisted Learning on Students’ Long-Term Development,” *Soc. Sci. Res. Netw.*, 2021, doi: https://dx.doi.org/10.2139/ssrn.3309169.
[16] M. Rizqi, M. Budiman, and M. D. Reza, “Socio-Cultural Changes in Modernization and Technology Viewed From The Learning Process,” *Int. J. Business, Educ. Humanit. Soc. Sci.*, vol. 5, no. 2, pp. 88–92, 2023, doi: https://doi.org/10.46923/ijbhes.v5i2.270.
[17] N. Sarah, “Social Exclusive of Education Inequality in the Covid-19 Pandemia by Education Digitalization Activities,” *QALAMUNA J. Pendidikan, Sos. dan Agama*, vol. 14, no. 2, pp. 263–274, Dec. 2022, doi: 10.37680/qalamuna.v14i2.1959.
[18] Muhaimin, Asrial, A. Habibi, A. Mukminin, and P. Hadisaputra, “Science teachers’ integration of digital resources in education: A survey in rural areas of one Indonesian province.,” *Heliyon*, vol. 6, no. 8, p. e04631, Aug. 2020, doi: 10.1016/j.heliyon.2020.e04631.
[19] K. P. S. S. Hadiningrat, V. A. J. M. Silalahi, and F. P. Wardani, “Opportunities and Challenges in Implementing Information Technology Innovations in the Indonesian Education Sector,” *East Asian J. Multidiscip. Res.*, vol. 3, no. 8, pp. 3763–3776, 2024, doi: https://doi.org/10.55927/eajmr.v3i8.10686.
[20] W. Creswell, John, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th editio. United States of America: SAGE Publication, Inc, 2014.
[21] S. S. Nair and N. A. Sharma, “Implementation of an Automated Result Management System in a Developing Country,” in *2022 IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE)*, 2022, pp. 1–6, doi: 10.1109/CSDE56538.2022.10089275.
[22] J. Leanjay, P. Ratanaworabhan, and T. Dalai, “A Tool for Automating IT Management in Small Schools,” in *2022 26th International Computer Science and Engineering Conference (ICSEC)*, 2022, pp. 49–54, doi: 10.1109/ICSEC56337.2022.10049374.
[23] S. Orhani, E. Saramati, L. Drini, M. Kolukaj, and M. Morina, “Benefits of Information and Communication Technology (ICT) in the Successful Management of Schools in the World: Increasing the Efficiency and Quality of Education,” *Int. J. Res. Innov. Soc. Sci.*, vol. VIII, no. IIIS, pp. 5078–5092, 2024, doi: https://dx.doi.org/10.47772/IJRISS.2024.803377S.
[24] D. G. Vasilev, “Planning A Strategy for the Digitalization of School,” *Educ. Technol. J.*, vol. 14, no. 1, pp. 91–95, 2023, doi: https://doi.org/10.26883/2010.231.4982.
[25] R. Girdzijauskienė, A. Norvilienė, G. Šmitienė, and L. Rupšienė, “Strengthening Student Engagement in Learning Through Use of Digital Tools,” *Acta Paedagog. Vilnensia*, vol. 49, pp. 115–130, 2022, doi: https://doi.org/10.15388/ActPaed.2022.49.8.
[26] L. Hietajärvi, K. Lonka, K. Hakkarainen, K. Alho, and K. Salmela-Aro, “Are Schools Alienating Digitally Engaged Students? Longitudinal Relations between Digital Engagement and School

Engagement," *Front. Learn. Res.*, vol. 8, no. 1, pp. 33–55, 2020, doi: https://doi.org/10.14786/flr.v8i1.437.

[27] I. Didmanidze, L. Tavdgiridze, V. Zaslavskyi, I. Khasaia, D. Dobordginidze, and Y. Olga, "The Impact of Digital Technologies in Education," in *2023 13th International Conference on Dependable Systems, Services and Technologies (DESSERT)*, 2023, pp. 1–7, doi: 10.1109/DESSERT61349.2023.10416515.

[28] S. Sansanwal, D. S., and J. S. Yadav, "Advancing Educational Outcomes: Bridging the Knowledge Gap in Technology Integration," *Soc. Sci. Res. Netw.*, 2023, doi: https://dx.doi.org/10.2139/ssrn.4633106.

[29] S. Chahal, "Unlocking Educational Excellence: A Digital Transformation Approach through Business Process Optimization and the Role of Agile Project Management to Overcome Barriers to Successful Transformation," *J. Econ. Manag. Res.*, vol. 4, no. 5, pp. 1–5, 2023, doi: https://doi.org/10.47363/jesmr%2F2023%284%29193.

[30] A. I. Amjad, S. Aslam, U. Tabassum, Z. A. Sial, and F. Shafqat, "Digital Equity and Accessibility in Higher Education: Reaching the Unreached," *Eur. J. Educ.*, vol. 59, no. 4, p. e12795, Dec. 2024, doi: https://doi.org/10.1111/ejed.12795.

[31] E. Sarva and K. E. Purina-Bieza, "Educators' Perspectives on the Main Challenges and Opportunities for Implementing Digital Solutions in Learning and Teaching," *Int. J. Emerg. Technol. Learn.*, vol. 18, no. 24, pp. 62–80, 2023, doi: https://doi.org/10.3991/ijet.v18i24.44745.

[32] P. M. Amos, P. K. A. Bedu-Addo, and T. Antwi, "Experiences of Online Counseling Among Undergraduates in Some Ghanaian Universities," *SAGE Open*, vol. 10, no. 3, p. 2158244020941844, Jul. 2020, doi: 10.1177/2158244020941844.

[33] J. Mtemeri, Y. Madhovi, J. Mutambara, and E. Maziti, "Technology and counselling in Africa: Reflections from MSc counselling students at a selected university in Zimbabwe," *Couns. Psychother. Res.*, vol. 22, no. 2, pp. 377–384, Jun. 2022, doi: https://doi.org/10.1002/capr.12443.

[34] N. Kaur and M. Kaur, "Role of Technology for Equality, Diversity and Inclusivity," *J. Learn. Educ. Policy*, vol. 1, no. 2, pp. 14–22, 2021, doi: https://doi.org/10.55529/jlep.12.14.22.

[35] C. A. Eden, O. N. Chisom, and I. S. Adeniyi, "Harnessing technology integration in education: Strategies for enhancing learning outcomes and equity," *World J. Adv. Eng. Technol. Sci.*, vol. 11, no. 02, pp. 001–008, 2024, doi: https://doi.org/10.30574/wjaets.2024.11.2.0071.