Sinkron : Jurnal dan Penelitian Teknik Informatika
Volume 10, Number 2, April 2026
DOI : https://doi.org/10.33395/sinkron.v10i2.15994
e-ISSN : 2541-2019
p-ISSN : 2541-044X

Mapping Elementary School Digital Transformation Readiness through SERI for Roadmap Development

Sondius Matogu Budiman Silalahi[1)], Handri Santoso [2)],
[1)]Pradita University, Indonesia, [2)] Pradita University, Indonesia
[1)]sondius.matogu@student.pradita.ac.id, [2)]Handri@ieee.org,

Submitted :March 11, 2026 | **Accepted** : March 31, 2026 | **Published** : April 2, 2026

Abstract: Digital transformation has become a strategic priority in elementary education as schools are increasingly expected to integrate digital technology into teaching, assessment, and institutional management. However, previous studies on school digital readiness have generally focused on isolated aspects such as infrastructure, digital literacy, or leadership, without providing an integrated assessment model that simultaneously evaluates process, technology, and organisational dimensions in elementary school contexts. This study aims to assess the digital transformation readiness of an elementary school using the Smart Education Readiness Index (SERI). A descriptive quantitative case-study approach was employed by adapting the SERI assessment matrix into the elementary school context. The assessment covered three dimensions process, technology, and organisation through twelve indicators. Data were collected through a structured assessment matrix, supporting document review, and expert validation involving two educational technology experts. The results indicate that the school reached a moderate level of digital transformation readiness. The strongest indicators were specific or specialised skills (2.635), digital infrastructure readiness (2.634), digital interconnectivity (2.598), and organisational planning indicators (2.562), while the weakest indicators were assessment (1.708), policy guidance (1.708), general or transversal skills (1.744), and digital storage (1.852). Unlike previous studies that mainly assess digital readiness through separate technological or pedagogical indicators, this study applies a multidimensional institutional assessment framework. This study contributes by proposing a structured and adaptable assessment approach for elementary school digital transformation that supports the development of a more measurable and context-sensitive digital transformation roadmap.

Keywords: digital transformation; elementary school; readiness assessment; SERI; educational roadmap

INTRODUCTION

Digital transformation in education has become a strategic priority rather than a supplementary initiative. Schools are increasingly expected to integrate digital technologies not only into classroom instruction, but also into assessment, communication, school management, and data-driven decision making (Rashid Al Nuaimi et al., 2024; Linda Castañeda & Daniel Villar-Onrubia, 2023). In this context, elementary schools hold a particularly important role because they establish the earliest formal foundation for digital literacy, critical thinking, creativity, collaboration, and adaptive learning habits. Therefore, digital transformation at the elementary school level should be understood as a comprehensive institutional change involving pedagogy, infrastructure, human resources, and governance, rather than merely the provision of devices or internet access.

Recent studies have shown that the success of digital transformation in schools is strongly influenced by teachers' digital competence, students' digital literacy, the availability of learning infrastructure, and the leadership capacity of school management. Teachers' digital competence affects how technology is selected, implemented, and aligned with learning objectives, while students' digital literacy determines how effectively they engage with digital learning environments. At the same time, leadership and organisational support remain crucial because digital transformation requires policy direction, resource planning, implementation commitment, and continuous evaluation.

*name of corresponding author

However, although previous studies have examined important aspects of educational digitalisation, most of them discuss these dimensions separately. Digital literacy is often measured independently from infrastructure readiness, while leadership studies rarely integrate pedagogical and technological dimensions within a single institutional framework. As a consequence, schools may initiate digital programmes without a structured basis for identifying institutional strengths, weaknesses, and development priorities.

This limitation becomes increasingly significant as educational digital transformation now also depends on stronger governance architecture and data-informed decision making. Structured information management has been recognised as an essential foundation for institutional governance in education, while predictive and analytic approaches increasingly support monitoring, planning, and strategic intervention. These developments indicate that digital transformation in schools should extend beyond classroom technology use and include readiness for governance integration, data management, and institutional strategy.

Despite these developments, previous studies have not provided an integrated readiness assessment model that simultaneously evaluates process, technology, and organisational dimensions in elementary school contexts. This creates a practical gap in understanding how elementary schools can assess readiness in a measurable, structured, and context-sensitive manner before implementing broader digital transformation programmes.

Unlike previous studies that mainly examine digital literacy, technology adoption, or school leadership as separate issues, this study evaluates digital transformation readiness through the Smart Education Readiness Index (SERI), an integrated framework that combines process, technology, and organisation. This multidimensional approach offers a more systematic basis for identifying institutional strengths, weaknesses, and priority areas for improvement.

Based on this background, this study aims to assess the digital transformation readiness of a private elementary school in Tigabinanga, Indonesia. The proposed approach evaluates readiness across three main dimensions process, technology, and organisation to determine the school's current readiness level and identify priority areas requiring improvement. This study contributes by proposing a structured and adaptable assessment approach for elementary school digital transformation. Practically, the findings are expected to support the development of a more measurable and context-sensitive school-level digital transformation roadmap. Academically, this study provides an applied readiness assessment model that strengthens the discussion of institutional digital transformation in elementary education.

LITERATURE REVIEW

Digital Transformation in Elementary Education

Digital transformation in education is no longer limited to the adoption of digital tools in classrooms. It increasingly involves the redesign of learning processes, assessment systems, institutional communication, and school management practices. Recent studies emphasise that effective digital transformation requires schools to move from isolated technology use toward a more integrated digital ecosystem that supports teaching, administration, and decision making (Al Nuaimi et al., 2024; Castañeda & Villar-Onrubia, 2023). In elementary schools, this transformation is particularly important because it shapes students' early exposure to digital learning environments and influences the development of foundational competencies needed for later educational stages (Al Nuaimi et al., 2024; Castañeda & Villar-Onrubia, 2023; Dewi, 2022).

Compared with studies that primarily discuss the strategic role of school leadership in digital transformation, such as Al Nuaimi et al. (2024), other studies place more emphasis on digital teaching competence and pedagogical preparedness, as shown by Castañeda and Villar-Onrubia (2023). This comparison suggests that digital transformation is not a single-dimensional issue, but a complex institutional process involving pedagogical, managerial, and technological change. However, much of the literature still discusses digital transformation conceptually or from a single institutional angle, making it less useful as an operational basis for evaluating school readiness in a structured way, especially in elementary education contexts.

Teacher and Student Digital Readiness

A major factor in school digital transformation is the readiness of teachers and students. Prior studies have shown that teachers' digital literacy and digital teaching competence strongly affect learning management, instructional design, and the alignment between technology use and pedagogical goals (Dewi, 2022; Ibda et al., 2023; Karakose et al., 2021). In elementary education, teacher readiness is especially critical because students still depend heavily on guided learning experiences. At the student level, digital literacy also plays a central role in determining how effectively learners interact with learning management systems, online materials, and digital feedback processes (Haleem et al., 2022).

A comparison across these studies shows that Dewi (2022) focuses more specifically on students' digital literacy in e-learning environments, while Ibda et al. (2023) examine teachers' digital literacy competence through a systematic literature review. Karakose et al. (2021), in contrast, relate teacher perspectives to school principals'

*name of corresponding author

e-ISSN : 2541-2019
p-ISSN : 2541-044X

digital leadership and technological capability. Together, these studies confirm that both teachers and students are essential actors in digital transformation. Nevertheless, the literature still tends to assess these actors separately. As a result, existing studies provide valuable insights into human readiness, but they do not yet offer an integrated model for assessing how teacher and student readiness interact with broader institutional conditions in elementary schools**.**

Leadership, Governance, and Organisational Support

Digital transformation also depends on leadership and organisational support. School leaders are expected to provide strategic direction, allocate resources, develop supportive policies, and sustain innovation within the school environment. Recent research shows that principals play a decisive role in the digital transformation of schools because leadership influences policy implementation, staff engagement, and innovation culture (Marnita & Nurdin, 2024; McCarthy et al., 2023). Without governance support, digital initiatives often remain fragmented and depend too heavily on individual effort rather than institutional commitment. Therefore, digital readiness assessment should include organisational dimensions such as planning, workforce capability, internal coordination, and policy direction.

In comparative terms, McCarthy et al. (2023) discuss digital transformation from the perspective of system-level leadership and change management, whereas Marnita and Nurdin (2024) focus more directly on institutional digital readiness in elementary education. Although both studies highlight the importance of governance and leadership, they do not fully translate these ideas into a multidimensional assessment structure that captures organisational, technological, and process-related readiness simultaneously. This indicates an important limitation in the literature: leadership is widely recognised as essential, but its role is often discussed descriptively rather than operationalised into a practical readiness framework.

Data, Governance, and Emerging Educational Intelligence

Recent developments in educational technology also indicate that digital transformation is becoming more dependent on data governance and intelligent systems. In this context, educational institutions need to be prepared not only for digital instruction but also for structured information management, analytics, and system-level integration. OECD (2023) emphasises that an effective digital education ecosystem requires coherent governance, data use, and institutional alignment. Similarly, Silalahi et al. (2025a) demonstrate how a semantic-web-enabled enterprise architecture framework can support curriculum governance through structured information management. In another study, Silalahi et al. (2025b) show that predictive modelling can be used to detect academic performance decline, highlighting the growing relevance of analytics and data-based intervention in education.

These studies broaden the meaning of school digital transformation beyond classroom technology by highlighting the importance of information architecture, analytics, and governance integration. However, they also reveal a gap in the literature. While OECD (2023) provides a macro-level policy perspective, and Silalahi et al. (2025a, 2025b) offer system-oriented and predictive approaches, these studies are not specifically designed as readiness assessment tools for elementary schools. Consequently, they strengthen the theoretical foundation for school digital transformation, but do not yet provide a practical instrument for evaluating institutional readiness at the elementary school level.

Readiness Assessment Framework

To address the need for an integrated assessment model, this study uses the Smart Education Readiness Index (SERI) as the main analytical framework. Recent regional work by SEAMEO VOCTECH (2024) shows that this framework was designed to assess educational readiness through three main dimensions: process, technology, and organisation. This structure is compatible with current discussions on digital education ecosystems, which stress the importance of aligning pedagogical practice, digital infrastructure, governance, and institutional data use (Al Nuaimi et al., 2024; Silalahi et al., 2025b). Therefore, SERI provides a practical and multidimensional basis for assessing elementary school digital transformation readiness in a way that is both structured and adaptable to local school contexts.

Compared with previous studies that focus on isolated variables, such as teacher literacy, student readiness, or leadership, SERI offers a more comprehensive structure for examining school readiness as an institutional condition rather than as a collection of separate factors. The main strength of this framework lies in its multidimensional orientation, which enables a more balanced analysis across process, technology, and organisation. However, its application in elementary school contexts still requires contextual interpretation and empirical adaptation. For this reason, the present study not only applies SERI as an assessment tool but also positions it as a practical basis for identifying institutional strengths, weaknesses, and priority areas for digital transformation roadmap development.

*name of corresponding author

Sinkron : Jurnal dan Penelitian Teknik Informatika
Volume 10, Number 2, April 2026
DOI : https://doi.org/10.33395/sinkron.v10i2.15994
e-ISSN : 2541-2019
p-ISSN : 2541-044X

METHODS

Research Design

This study employed a descriptive quantitative approach to assess the digital transformation readiness of an elementary school using the Smart Education Readiness Index (SERI) framework. The descriptive quantitative design was selected because the study aimed to measure the school's current readiness level across several indicators and identify priority areas for improvement without applying any experimental intervention. In addition, the study was designed as a school-level case study to obtain a contextual understanding of digital transformation readiness in an elementary education environment.

Research Site and Object

The study was conducted at a private elementary school located in Tigabinanga, Indonesia. The school was selected because it has begun to implement several technology-related educational initiatives, including digital learning support, robotics-based activities, and technology-assisted instructional practices. However, despite these initiatives, the school had not previously been assessed using a structured digital readiness framework. Therefore, the school provided an appropriate context for examining digital transformation readiness from the perspectives of process, technology, and organisation.

Assessment Framework

This study adopted the Smart Education Readiness Index (SERI) as the main assessment framework because it offers a multidimensional structure for evaluating educational readiness through three major dimensions: process, technology, and organisation. The framework was selected due to its multidimensional capability to simultaneously evaluate pedagogical readiness, technological readiness, and organisational readiness within a single institutional assessment structure.

The framework was operationalised through twelve indicators. The process dimension consisted of general or transversal skills, specific or specialised skills, teaching and learning process, and assessment. The technology dimension included digital infrastructure readiness, digital storage, machine learning, and digital interconnectivity. The organisation dimension consisted of policy guiding digital transformation adoption, plans to implement digital transformation, current workforce capability, and capable task force.

Table 1. SERI Dimensions and Indicators

Dimension	Indicator
Process	General or Transversal Skills, Specific or Specialised Skills, Teaching and Learning Process, Assessment
Technology	Digital Infrastructure Readiness, Digital Storage, Machine Learning, Digital Interconnectivity
Organisation	Policy Guiding Digital Transformation Adoption, Plans to Implement Digital Transformation, Current Workforce Capability, Capable Task Force

Data Collection

Data were collected using an assessment matrix adapted from the Smart Education Readiness Index framework. The matrix was completed through structured discussion and evaluation involving school stakeholders familiar with instructional practices, infrastructure conditions, and organisational planning. Supporting school documents related to learning activities, technology implementation, institutional planning, and digital support practices were also reviewed to strengthen the assessment.

The collected data reflected the school's current condition in relation to each indicator. This approach was used to ensure that the readiness assessment was based on actual school practices rather than on general assumptions about technology adoption.

*name of corresponding author

Sinkron : Jurnal dan Penelitian Teknik Informatika
Volume 10, Number 2, April 2026
DOI : https://doi.org/10.33395/sinkron.v10i2.15994
e-ISSN : 2541-2019
p-ISSN : 2541-044X

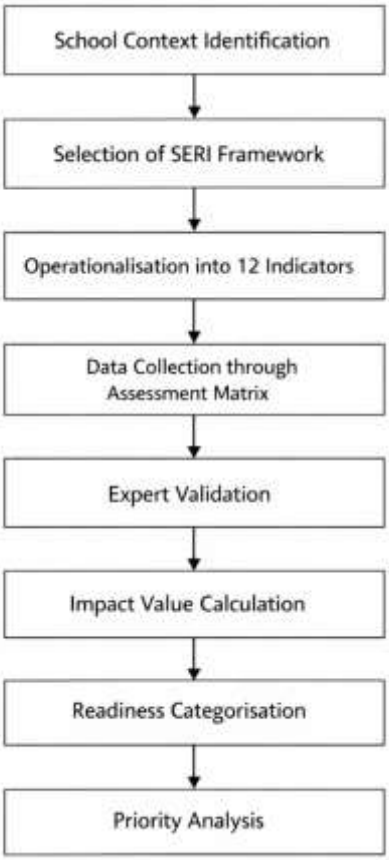

Figure. 1 Research Procedure for Assessing Elementary School Digital Transformation Readiness

Figure 1 illustrates the overall research procedure used in this study. The process began with identifying the school context and selecting the Smart Education Readiness Index (SERI) as the main analytical framework. The framework was then operationalised into twelve indicators under three dimensions, namely process, technology, and organisation. Data were collected through an assessment matrix and supporting document review, followed by expert validation involving two educational technology experts. The resulting scores were processed to calculate impact values, classify readiness levels, and identify priority areas for digital transformation development.

Validity and Instrument Review

To improve the credibility of the instrument, the assessment matrix was reviewed by two experts in educational technology prior to its implementation. The expert review focused on the relevance, clarity, and contextual suitability of the twelve indicators used to assess elementary school digital transformation readiness. Both experts considered the instrument appropriate for evaluating the process, technology, and organisational dimensions of digital transformation in elementary school settings and suggested minor adjustments in wording to improve contextual clarity.

This expert review served as a form of content validation to ensure that each indicator adequately represented the intended dimensions of the Smart Education Readiness Index framework.

Table 2. Expert Validation Summary

Validation Aspect	Expert 1	Expert 2	Overall Remark
Indicator relevance	Appropriate	Appropriate	Valid
Clarity of wording	Appropriate	Appropriate	Valid
Suitability for elementary school context	Appropriate	Appropriate	Valid

Table 2 shows the summary of expert validation results conducted prior to the implementation of the assessment instrument. Both experts agreed that the twelve indicators were relevant, clearly formulated, and suitable for evaluating digital transformation readiness in an elementary school context. Minor wording adjustments suggested during the review process were incorporated before the instrument was applied in the study.

*name of corresponding author

Sinkron : Jurnal dan Penelitian Teknik Informatika
Volume 10, Number 2, April 2026
DOI : https://doi.org/10.33395/sinkron.v10i2.15994
e-ISSN : 2541-2019
p-ISSN : 2541-044X

Data Analysis

The data analysis was carried out in several stages. First, each indicator in the assessment matrix was scored based on the observed and documented condition of the school. Second, the scores were processed to generate an impact value for each indicator. Third, the impact values were interpreted to classify the school's readiness level and determine the dimensions that represented strengths and weaknesses.

In this study, readiness levels were grouped into three categories. An impact value of 2.50 or higher was classified as high, a value between 2.00 and 2.49 was classified as moderate, and a value below 2.00 was classified as low. These categories were used to support the interpretation of the school's readiness profile and identify dimensions that should be prioritised for further development.

Consistency of assessment was maintained by applying the same scoring logic across all indicators and by cross-checking the assigned scores with supporting school documents and stakeholder discussion results.

RESULTS

The assessment results show that the elementary school reached a moderate level of digital transformation readiness. This finding indicates that the school has established an initial foundation for digital transformation, but the level of readiness remains uneven across indicators and dimensions. Several indicators already demonstrate relatively strong readiness, particularly in specialised instructional competence, digital infrastructure, connectivity, and implementation planning. However, other indicators remain weak, especially those related to assessment, policy guidance, digital storage, and internal implementation support.

To provide a more detailed picture, Table 3 presents the impact value and readiness category for each of the twelve indicators across the three SERI dimensions: process, technology, and organisation.

Table 3. Impact Value and Readiness Category for Each Indicator

Dimension	Indicator	Impact Value	Category
Process	General or Transversal Skills	1.744	Low
Process	Specific or Specialised Skills	2.635	High
Process	Teaching and Learning Process	2.490	Moderate
Process	Assessment	1.708	Low
Technology	Digital Infrastructure Readiness	2.634	High
Technology	Digital Storage	1.852	Low
Technology	Machine Learning	1.889	Low
Technology	Digital Interconnectivity	2.598	High
Organisation	Policy Guiding Digital Transformation Adoption	1.708	Low
Organisation	Plans to Implement Digital Transformation	2.562	High
Organisation	Current Workforce Capability	2.562	High
Organisation	Capable Task Force	1.889	Low

The categorisation was determined based on the impact value range. An impact value of 2.50 or above was classified as high, a value between 2.00 and 2.49 was classified as moderate, and a value below 2.00 was classified as low.

Among the indicators in the process dimension, specific or specialised skills obtained the highest score at 2.635, followed by teaching and learning process at 2.490. In contrast, assessment received one of the lowest scores in this dimension at 1.708, while general or transversal skills also remained in the low category with a score of 1.744. These results suggest that the school has shown stronger readiness in focused instructional competence than in broader pedagogical integration and digital assessment practices.

In the technology dimension, digital infrastructure readiness and digital interconnectivity showed the strongest performance, with scores of 2.634 and 2.598, respectively. Meanwhile, digital storage and machine learning were both categorised as low, with scores of 1.852 and 1.889. These findings indicate that the school is relatively prepared in terms of basic infrastructure and connectivity, but still lacks readiness in data-related support and more advanced digital intelligence.

*name of corresponding author

Sinkron : Jurnal dan Penelitian Teknik Informatika
Volume 10, Number 2, April 2026
DOI : https://doi.org/10.33395/sinkron.v10i2.15994
e-ISSN : 2541-2019
p-ISSN : 2541-044X

For the organisation dimension, plans to implement digital transformation and current workforce capability both reached 2.562, placing them in the high category. However, policy guiding digital transformation adoption recorded a score of 1.708, and capable task force scored 1.889, indicating that policy support and internal implementation mechanisms remain underdeveloped compared with planning and workforce readiness.

Overall, the results reveal an uneven readiness profile. The school demonstrates stronger readiness in specialised competence, digital infrastructure, connectivity, implementation planning, and workforce capability, while weaker readiness appears in assessment, policy support, digital storage, and internal task force capacity.

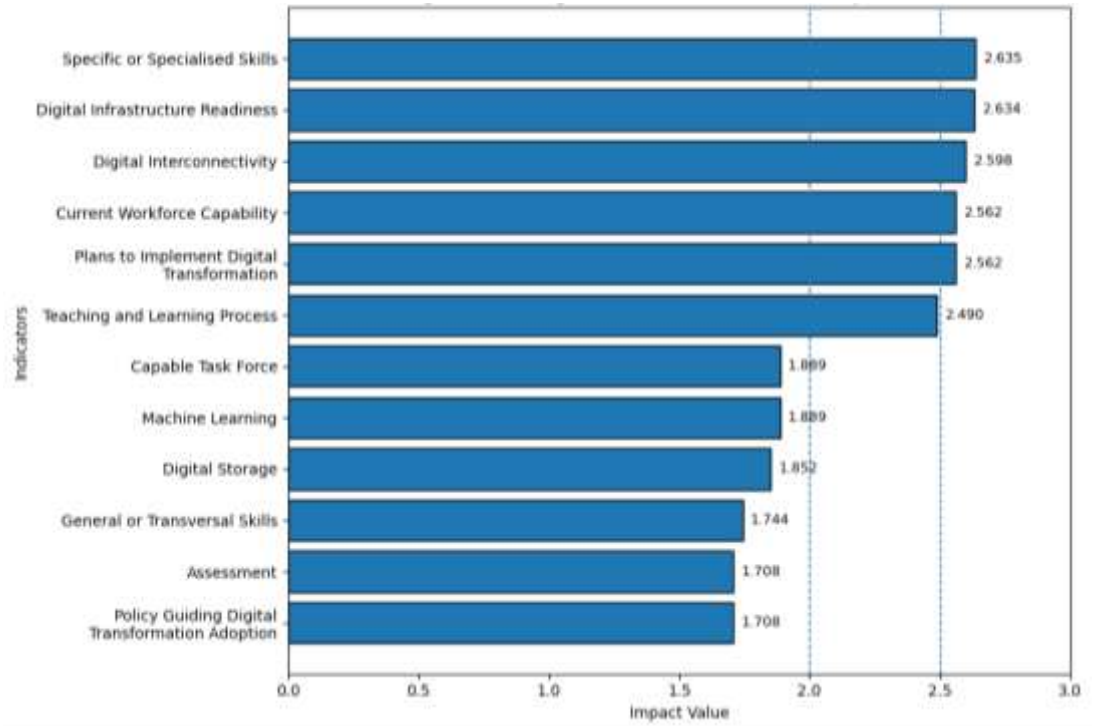

Figure. 2 Ranking of SERI Indicators Based on Impact Value

Figure 2 presents the ranking of the twelve SERI indicators based on their impact values. The highest scores were obtained by specific or specialised skills (2.635), digital infrastructure readiness (2.634), digital interconnectivity (2.598), plans to implement digital transformation (2.562), and current workforce capability (2.562). These results indicate that the school's strongest readiness areas are related to specialised instructional competence, basic technological infrastructure, connectivity, and initial organisational preparedness. In contrast, the lowest scores were found in assessment (1.708), policy guiding digital transformation adoption (1.708), general or transversal skills (1.744), digital storage (1.852), and capable task force (1.889). This ranking suggests that although the school has established an initial foundation for digital transformation, important weaknesses remain in assessment, policy support, and internal implementation capacity.

To further strengthen the interpretation, the ranking analysis confirms that readiness is not evenly distributed across all indicators. The gap between the highest and lowest indicators shows that the school's digital transformation is progressing more strongly in operational and infrastructure-related aspects than in governance and evaluative support systems. This pattern is important because strong infrastructure alone does not guarantee comprehensive institutional digital transformation unless it is supported by policy, assessment practices, and internal coordination mechanisms.

Dimension-Level Gap Analysis

To identify broader readiness patterns, the average score of each SERI dimension was calculated. The results show that technology obtained the highest average score, followed by organisation and process. Process = 2.144, Technology = 2.243, Organisation = 2.180.

*name of corresponding author

Sinkron : Jurnal dan Penelitian Teknik Informatika
Volume 10, Number 2, April 2026
DOI : https://doi.org/10.33395/sinkron.v10i2.15994
e-ISSN : 2541-2019
p-ISSN : 2541-044X

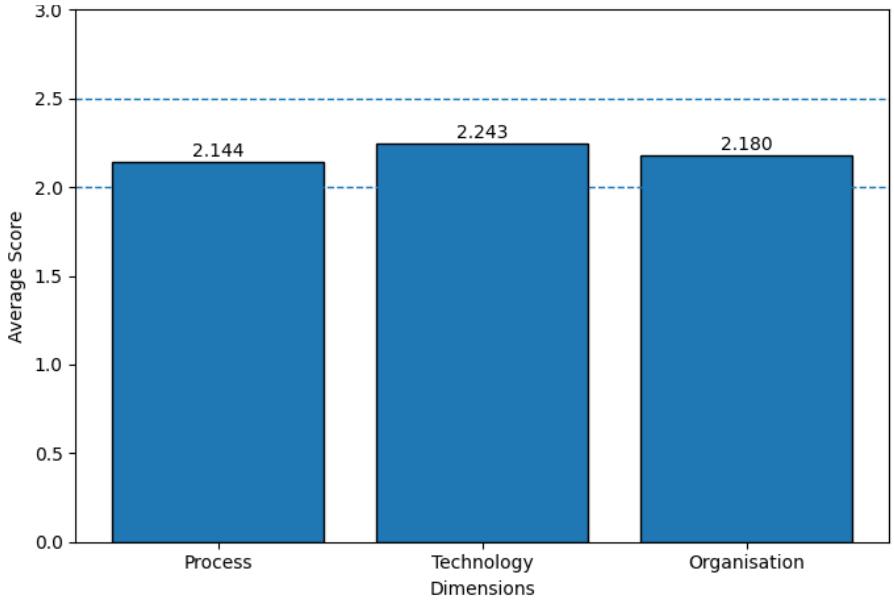

Figure. 3 Average Readiness Score by Dimension

Figure 3 shows the average readiness score across the three SERI dimensions. The technology dimension obtained the highest average score (2.243), followed by organisation (2.180) and process (2.144). These results indicate that technological readiness represents the strongest dimension in the school's digital transformation profile, particularly due to relatively high scores in digital infrastructure readiness and digital interconnectivity. Although the organisation dimension also reached a moderate level, several indicators such as policy guidance and internal task force capability remained relatively weak. The process dimension showed the lowest average score, suggesting that pedagogical implementation and assessment practices still require further strengthening to support more comprehensive digital transformation. Although all three dimensions fall within the moderate readiness category, the relatively small gap among them indicates that digital transformation development in the school is progressing unevenly across institutional areas rather than being concentrated in a single dominant dimension.

DISCUSSION

The findings show that the elementary school has reached a moderate level of digital transformation readiness, but the readiness profile remains uneven across indicators and dimensions. This means that the school has established an initial digital foundation, yet the transformation process is still developing selectively rather than comprehensively. This result is consistent with prior studies showing that digital transformation in schools often begins with visible improvements in technology access and instructional use, while governance, assessment, and institutional integration develop more slowly (Al Nuaimi et al., 2024; McCarthy et al., 2023). From a theoretical perspective, digital transformation in education should be understood as a multidimensional institutional change rather than a purely technical shift, because sustainable transformation requires the alignment of pedagogy, infrastructure, and organisational support.

The high score obtained by specific or specialised skills indicates that the school already possesses relatively strong targeted competence in using digital tools for instructional activities. This suggests that digital transformation at the operational teaching level has begun to develop positively. Similar findings were reported by Ibda et al. (2023) and Haleem et al. (2022), who found that teacher competence strongly influences successful digital adoption in schools. Theoretically, this can be explained by the view that digital transformation in education often begins with human capability before broader institutional integration occurs, because technology adoption depends on how educators interpret, adapt, and apply digital tools in actual teaching practice.

A similarly strong pattern can be seen in digital infrastructure readiness and digital interconnectivity. The high scores in these indicators indicate that the school has already established adequate technological access to support digital activities. In practical terms, this means that the availability of devices, internet connectivity, and basic digital support systems already provides a favourable environment for further transformation. This finding is in line with Castañeda and Villar-Onrubia (2023), who emphasised that infrastructure readiness often becomes one of the earliest visible signs of digitalisation in educational institutions. However, from a theoretical perspective, infrastructure functions only as an enabling condition. Its presence does not automatically result in meaningful transformation unless it is integrated into broader pedagogical processes and organisational routines.

*name of corresponding author

Sinkron : Jurnal dan Penelitian Teknik Informatika
Volume 10, Number 2, April 2026
DOI : https://doi.org/10.33395/sinkron.v10i2.15994
e-ISSN : 2541-2019
p-ISSN : 2541-044X

The relatively high score in plans to implement digital transformation also indicates that the school has demonstrated institutional awareness and planning readiness. This suggests that digital transformation is not occurring only through incidental classroom practice, but is already recognised as an institutional agenda. This finding is comparable with Al Nuaimi et al. (2024), who highlighted the role of planning and leadership direction in shaping school digital transformation. In theoretical terms, planning represents the strategic dimension of readiness, because institutions are more likely to sustain innovation when digital initiatives are linked to deliberate goals, priorities, and development stages rather than relying on spontaneous or fragmented adoption.

The high score in current workforce capability further suggests that the school has relatively adequate human resource readiness to support digital transformation. This means that the institutional workforce is not entirely dependent on external support and already has a sufficient basis for participating in technology-based change. This result is comparable with research showing that teacher and staff capability significantly affects the success of school digitalisation initiatives (Ibda et al., 2023; Karakose et al., 2021). Theoretically, workforce capability represents organisational capital, which is essential because digital transformation requires not only tools and systems, but also actors who are able to operate, adapt, and sustain those systems over time.

In contrast, the low score found in assessment suggests that digital transformation has not yet been fully integrated into learning evaluation practices. Although classroom teaching may already involve digital support, assessment systems remain relatively conventional. This pattern is consistent with McCarthy et al. (2023), who noted that schools frequently adopt digital tools for instruction faster than for evaluation and monitoring. From a theoretical perspective, assessment transformation is often more complex because it requires changes not only in tools, but also in evaluation design, feedback processes, evidence collection, and teacher confidence in using digital systems to support learning measurement.

The low score in general or transversal skills indicates that the school's digital transformation is stronger in focused instructional competence than in broader cross-cutting competencies. This means that while certain digital practices are already developing, more general capacities such as collaborative problem solving, adaptive digital thinking, and broader digital learning habits may not yet be embedded systematically. This result can be compared with Dewi (2022), who showed that digital readiness at the school level should not be reduced to tool use alone, but must also involve broader student and teacher competencies. Theoretically, transversal skills are important because they connect specific technological ability with long-term educational adaptability, making them central to sustainable school transformation.

The weak score in digital storage suggests that the school still faces limitations in data-related readiness. This indicates that digital transformation is currently stronger at the level of access and instructional use than at the level of structured information management. Similar observations can be linked to OECD (2023), which emphasised that digital education ecosystems require not only devices and networks but also coherent systems for information storage, management, and institutional use. From a theoretical standpoint, data readiness is an important component of digital maturity because institutions increasingly depend on organised information systems for documentation, planning, and decision making.

The low score in machine learning indicates that advanced digital intelligence has not yet become part of the school's readiness profile. This is understandable in the context of elementary education, where digital transformation usually begins with foundational technologies rather than predictive or analytic systems. Nevertheless, this finding also suggests that the school is still at an early-to-intermediate stage of digital maturity. This is consistent with recent discussions by Paryono and Mashod (2024) and Silalahi et al. (2025b), which show that educational digital transformation is increasingly connected to data analytics, monitoring, and intelligent support systems. Theoretically, advanced analytics represents a higher maturity stage because it requires the prior existence of organised digital data, clear governance, and stable technological infrastructure.

The weak score in policy guiding digital transformation adoption indicates that institutional governance remains less developed than operational readiness. This means that digital activities may already occur in practice, but they are not yet fully reinforced through formal school-level policy. This finding aligns with OECD (2023) and Marnita and Nurdin (2024), both of which stress that policy support is essential for sustaining digital transformation beyond individual initiatives. From an organisational theory perspective, policy functions as an institutional reinforcement mechanism that ensures continuity, coordination, legitimacy, and resource allocation. Without such policy support, digital transformation is likely to remain fragmented and dependent on individual enthusiasm.

A similar concern appears in the low score of capable task force. This indicates that the school still lacks a sufficiently strong internal implementation structure to coordinate digital transformation consistently. In practice, this means that although the school may already have planning readiness and workforce capability, it does not yet have a specialised internal team that can translate plans into coordinated action. This finding can be compared with McCarthy et al. (2023), who emphasised the role of structured leadership and coordination in ensuring effective

*name of corresponding author

educational system change. Theoretically, an internal task force represents implementation capacity, which is necessary to bridge the gap between strategic intention and operational execution.

At the dimension level, the technology dimension obtained the highest average score, followed by organisation and process. This indicates that the school progresses faster in technological readiness than in pedagogical and procedural transformation. Similar tendencies have been reported by Al Nuaimi et al. (2024), where infrastructure and technological support often develop earlier than pedagogical redesign and governance integration. Theoretically, this occurs because technology investment is usually more visible, more measurable, and often easier to initiate than changes in instructional culture, assessment systems, and institutional routines.

The relatively lower average score of the process dimension is particularly important because it reflects limitations in broader pedagogical adaptation. While specialised instructional skills are already strong, broader competencies and assessment practices remain weaker. This suggests that digital transformation in the school is still concentrated on selected teaching activities rather than embedded across the full teaching and learning cycle. This pattern supports the argument that pedagogical transformation requires deeper institutional change than technology provision alone, because teaching processes are closely linked to curriculum design, evaluation, and teacher professional practice.

Taken together, the findings confirm that elementary school digital transformation readiness should be understood as an interaction between instructional competence, technological support, and organisational preparedness. This is precisely why an integrated framework such as SERI is important. Unlike studies that focus only on isolated variables such as literacy, infrastructure, or leadership, the present study shows that readiness becomes more meaningful when these dimensions are examined together as part of a single institutional condition.

From a practical perspective, the results suggest that the school's next development priorities should focus on strengthening digital assessment practices, formal policy support, digital data management, and internal coordination mechanisms. These areas are strategically important because they represent the weakest indicators while also influencing the school's ability to sustain the strengths already achieved in infrastructure, connectivity, and specialised competence. In other words, the school does not primarily need to rebuild its technological base, but rather to deepen institutional integration and pedagogical maturity.

Academically, this study contributes by showing that institutional digital transformation readiness in elementary schools can be assessed through a structured and adaptable framework that captures not only technological conditions but also pedagogical and organisational gaps. This strengthens the discussion of digital transformation in elementary education by moving beyond single-variable analysis and offering a more applied institutional readiness perspective. The findings therefore support the broader argument that school digital transformation should be analysed as a coordinated process of technological, pedagogical, and organisational development.

CONCLUSION

This study assessed the digital transformation readiness of an elementary school using the Smart Education Readiness Index (SERI) framework and found that the school is positioned in the moderate readiness category. This indicates that the school has established an initial foundation for digital transformation, but the readiness remains uneven across process, technology, and organisational dimensions. The strongest indicators were identified in specific or specialised skills, digital infrastructure readiness, digital interconnectivity, implementation planning, and current workforce capability, suggesting that the school already possesses important operational strengths to support technology-based learning and institutional digital development.

At the same time, several important weaknesses were identified, particularly in assessment, policy guiding digital transformation adoption, digital storage, machine learning, and capable task force. These findings indicate that digital transformation in the school is currently more developed at the operational and infrastructure level than at the governance, evaluative, and data-support level. Therefore, the next stage of school development should not focus solely on expanding digital access, but should prioritise strengthening digital assessment practices, formal policy support, internal coordination mechanisms, and structured data management as part of a more sustainable institutional transformation strategy.

Scientifically, this study contributes by demonstrating that elementary school digital transformation readiness can be assessed through an integrated multidimensional framework that simultaneously captures pedagogical, technological, and organisational conditions. This contribution is important because previous educational digitalisation studies have often examined these dimensions separately rather than as a unified institutional readiness structure. By applying SERI in an elementary school context, this study extends the practical use of readiness assessment frameworks to basic education and offers an applied institutional model that can support future school transformation studies.

Practically, the findings provide a measurable basis for school-level decision making by identifying priority areas that require immediate intervention. The results can be used by school leaders, education managers, and

*name of corresponding author

policy planners to design more context-sensitive digital transformation roadmaps, particularly in determining which areas should be strengthened first before broader digital initiatives are expanded.

Future studies are recommended to apply the same framework across multiple elementary schools with different institutional characteristics in order to generate comparative readiness patterns. In addition, future research may integrate expert scoring with quantitative validation techniques such as reliability testing or longitudinal measurement to examine how digital readiness changes over time and how it relates to actual learning outcomes and institutional performance.

REFERENCES

Al Nuaimi, H., Ahmad, S. Z., & Khalid, K. (2024). The importance of the school principals' role in the digital transformation of the education sector. *International Journal of Comparative Education and Development, 26*(1), 17–37. https://doi.org/10.1108/IJCED-05-2023-0044

Castañeda, L., & Villar-Onrubia, D. (2023). Beyond functionality: Building critical digital teaching competence among future primary education teachers. *Contemporary Educational Technology, 15*(1), Article e397. https://doi.org/10.30935/cedtech/12599

Dewi, C. (2022). Digital literacy analysis of elementary school students through implementation of e-learning based learning management system. *Journal of Education Technology, 6*(2), 199–206. https://doi.org/10.23887/jet.v6i2.44160

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers, 3*, 275–285. https://doi.org/10.1016/j.susoc.2022.05.004

Ibda, H., Syamsi, I., & Rukiyati, R. (2023). Digital literacy competency of elementary school teachers: A systematic literature review. *International Journal of Evaluation and Research in Education, 12*(3), 1609–1618. https://doi.org/10.11591/ijere.v12i3.24559

Karakose, T., Polat, H., & Papadakis, S. (2021). Examining teachers' perspectives on school principals' digital leadership roles and technology capabilities during the COVID-19 pandemic. *Sustainability, 13*(23), Article 13448. https://doi.org/10.3390/su132313448

Li, R. C., Cheung, S. K., Ng, P. H., Wong, L., & Wang, F. L. (Eds.). (2022). *15th International Conference on Blended Learning, ICBL 2022*. Lecture Notes in Computer Science (Vol. 13357). Springer.

Marnita, M., & Nurdin. (2024). Digital readiness assessment in elementary education: Institutional perspective. *Jurnal Penelitian Pendidikan Indonesia, 10*(4). https://doi.org/10.22373/jppi.v10i4.21834

McCarthy, A. M., Maor, D., McConney, A., & Cavanaugh, C. (2023). Digital transformation in education: Critical components for leaders of system change. *Social Sciences & Humanities Open, 8*(1), Article 100479. https://doi.org/10.1016/j.ssaho.2023.100479

Organisation for Economic Co-operation and Development (OECD). (2023). *OECD digital education outlook 2023: Towards an effective digital education ecosystem*. OECD Publishing.

Paryono, H., & Mashod, H. (2024). Smart education readiness in Southeast Asian educational transformation. *(Data publikasi tidak lengkap—perlu dilengkapi jurnal/penerbit)*

Schafer, S. B. (2025). Evolutionary learning in an age of mediated illusion: Virtual realities and mediated dream images for cultural healing. In *[Judul buku tidak lengkap]* (pp. 221–232). Taylor & Francis. https://doi.org/10.4324/9781003402572-19

Silalahi, S. M. B., Indrajit, R. E., & Mantoro, T. (2025a). Development of a semantic-web enabled enterprise architecture framework for curriculum governance. In *2025 IEEE 11th International Conference on Computing, Engineering and Design (ICCED)* (pp. 1–6). IEEE. https://doi.org/10.1109/ICCED68324.2025.11324880

Silalahi, S. M. B., Indrajit, R. E., & Mantoro, T. (2025b). Development of a prediction model for academic performance decline using two-layer ensemble progressive learning. In *2025 IEEE 11th International Conference on Computing, Engineering and Design (ICCED)* (pp. 1–6). IEEE. https://doi.org/10.1109/ICCED68324.2025.11324836

SEAMEO VOCTECH. (2024). *Smart education readiness framework for Southeast Asian schools*. Brunei Darussalam.

*name of corresponding author