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# Contextual Smart School Architecture Integrating SERI and TIER for Digital Transformation

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**Abstract:** The digital transformation of elementary education has become an inevitable demand in the era of the Fourth Industrial Revolution. Nevertheless, schools in non-metropolitan regions continue to face persistent challenges, including limited infrastructure, low technology penetration, and insufficient policy support. This study aims to design a contextual smart school architecture by integrating the Smart Education Readiness Index (SERI) and the Transformation Impact and Essential Readiness (TIER) framework. A descriptive–qualitative approach, supported by quantitative survey data from 40 educators and education personnel, was employed to assess institutional readiness and formulate strategic priorities. The SERI assessment revealed an average digital readiness score of 3.12 (scale 0–4), with four dominant dimensions: Teaching and Learning Process (3.45), Assessment (3.28), Innovative Analysis (3.21), and IR 4.0 Policy (3.30). These dimensions were further validated through a Prioritisation Matrix weighted at 60% for cost factors, 20% for key performance indicators, and 20% for contextual proximity. The findings emphasize that effective digital transformation must leverage local strengths, be aligned with global frameworks, and be implemented through structured strategies. The key contribution of this research lies in the proposal of a modular, integrated, and sustainable smart school architecture model that can be replicated nationally to bridge global standards with local realities. This study provides both theoretical insights and practical implications for policymakers and educational leaders seeking to advance equitable digital transformation in non-metropolitan schools.

**Keywords:** Archimate, Digital Transformation, SERI Assessment, Smart School Architecture, TIER Framework

## INTRODUCTION

The Fourth Industrial Revolution has transformed work, learning, and social interaction. In education, it demands intelligent technologies, data-driven systems, and agile management. Yet, institutional readiness especially in regions with limited technology and weak policy support—remains the main challenge. Educational leaders and policymakers face increasing pressure to adopt systematic approaches to transformation supported by digital innovation (McCarthy et al., 2023).

A smart school is a concept that integrates information and communication technology (ICT) into all aspects of learning and school management. This concept combines online and offline learning methods simultaneously, commonly referred to as a hybrid approach (Khadaffi et al., 2021). The smart school concept can be developed through the adaptation of the Smart Education Reference Architecture as an enterprise architecture reference model encompassing the business, data, application, and technology domains, thereby supporting a systematic and sustainable digital transformation in education (Hamza et al., 2022). Technology-based schools utilize digital devices, the internet, and information systems to support an integrated learning ecosystem while simultaneously streamlining school management. Teacher training in the development of interactive learning content has been shown to increase knowledge and skills by an average of 84.85% (Wahyudin et al., 2023). This demonstrates the significant impact of digitalization on the quality of education. In several countries, digital transformation has even become a national priority. For instance, education in Vietnam has undergone major changes and is recognized as one of the eight key areas in the national digital transformation agenda. The Covid-19 pandemic accelerated the shift in educational trends from conventional to digital formats, exemplified by the concept of the "University of

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the Future" (Pham et al., 2021). Smart schools are considered to be strengthened through the integration of the Internet of Educational Things (IoET) and environmental chatbot services that support health, safety, and the sustainability of technology-based educational ecosystems (Rukhiran et al., 2022).

The integration of technology into the curriculum has become a crucial aspect that has been implemented in various countries (Alvendri et al., 2023). Smart architecture in educational buildings, especially green schools, supports environmental learning and promotes energy efficiency. This is achieved through locally adapted design standards and supportive policies (Elbadawy & Elagami, 2021). The current Indonesian government policy also emphasizes the importance of mastering digital skills by integrating programming (coding) and artificial intelligence into the curriculum. This reflects an awareness that students must comprehend the increasingly pervasive developments of the digital world in line with the demands of the Fourth Industrial Revolution. Consequently, schools are required to adapt promptly in order not to be left behind in the global wave of change.

## LITERATURE REVIEW

Research on the concepts of smart schools and smart campuses has been extensively conducted, focusing on the integration of digital technologies to support adaptive learning and educational management. The utilization of big data and data warehouses can be employed to analyze student behavior, thereby enabling the development of adaptive learning systems that foster personalization and enhance the effectiveness of school management (Xi & Hao, 2024). The smart school paradigm can be further consolidated through the development of integrated platforms within the framework of Smart City initiatives. Within this context, the educational model functions as a comprehensive information system encompassing schools, universities, and digital learning services. Such integration not only facilitates broader access to education but also enables the provision of adaptive and responsive learning opportunities for society at large (Pramanik et al., 2024).

In addition, an ecosystem based on the Internet of Things (IoT) and Decision Support Systems (DSS) can facilitate real-time monitoring of student behavior, provide personalized coaching, and promote the adoption of healthy habits that contribute to improving both educational quality and child health (Bastida et al., 2023). Smart schools can be associated with the development of smart regions, wherein access to educational services becomes an integral component of a socially integrated ecosystem supported by information technology and intelligent mobility systems. This integration enables education to be sustainably accessible across both urban and rural areas (Billones et al., 2021).

To address these challenges, this study adopts a data-driven approach by employing a globally validated framework. The initial assessment is conducted using the Smart Education Readiness Index (SERI), developed by SEAMEO VOCTECH. This framework evaluates school readiness across three core blocks process, technology, and organization each representing strategic dimensions in educational transformation (SEAMEO VOCTECH Regional Centre, 2024). SERI comprises 19 dimensions with a set of questions designed to assess schools' digital readiness. This approach aligns with the principle of asset-based development, which emphasizes institutional empowerment through internal potential. SERI has been widely applied across Southeast Asia as a diagnostic tool for evaluating schools' digital readiness.

To systematically translate the outcomes of the readiness assessment into actionable implementation strategies, this study employs the TIER Framework, derived from the Smart Industry Readiness Index (SIRI) developed by the Singapore Economic Development Board. The framework is structured around four foundational principles Today's State, Impact to Bottom Line, Essential Objectives, and References to the Broader Community. Collectively, these principles provide a rigorous basis for institutions to prioritize transformation initiatives by aligning urgency, potential impact, and contextual relevance, thereby ensuring that digital transformation in education is both strategically targeted and sustainable (Singapore Economic Development Board, 2020). Digitalization in non-metropolitan areas is not solely concerned with technology but also encompasses local ecosystems and values. By designing an integrated and systematic digital smart school framework to support learning processes, management, and school adaptation to the challenges of the information era, the results demonstrate a framework capable of interconnecting all school operations in a cohesive manner, thereby enhancing educational quality and operational effectiveness (Phokajang & Netinant, 2021). The limited digital capacity of schools, constraints in technological proficiency, and disparities in access constitute major barriers to educational transformation. Accordingly, this study not only designs the technological architecture and smart school applications but also formulates short-term strategies grounded in local strengths to ensure relevance to the socio-economic conditions of the region. By integrating the Smart Education Readiness Index (SERI) with the TIER Framework of the Smart Industry Readiness Index (SIRI), this approach seeks to bridge global standards with local realities, thereby offering a transferable model for other educational institutions confronting similar challenges (Timotheou et al., 2023).

Although previous studies have explored smart schools and technology integration, most focus on metropolitan contexts with adequate infrastructure and often emphasize single technical aspects such as IoT, big data, or smart campus integration without systematically linking them to readiness frameworks. This study addresses that gap by

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proposing a contextual smart school architecture for non-metropolitan regions facing infrastructure, policy, and human resource limitations. Its novelty lies in integrating the Smart Education Readiness Index (SERI) with the Transformation Impact and Essential Readiness (TIER) framework into a modular and sustainable model that not only diagnoses digital readiness but also translates it into actionable strategic priorities. The contribution of this research is the development of an architecture that bridges global standards with local realities and offers a replicable model for equitable digital transformation in similar educational contexts.

## METHOD

This study uses a descriptive qualitative approach with limited quantitative support to assess digital readiness and design contextual smart school architecture. This method captures school conditions in depth while providing a quantitative basis for strategic decisions. In the current landscape, educational leaders and policymakers are increasingly compelled to adopt systematic approaches to transformation, driven by the opportunities and pressures generated by digital innovation (McCarthy et al., 2023). This study is designed to address practical needs while contributing to academic discourse. The methodology consists of three main stages: readiness diagnosis, strategic prioritization, and the design of technological architecture and smart school applications.


Fig. 1 Research Methodology Diagram

### Readiness Diagnosis: SERI Assessment

The first stage of this study involves readiness diagnosis using the Smart Education Readiness Index (SERI). SERI classifies 19 dimensions into eight pillars, which are subsequently generalized into three core blocks: Process, Technology, and Organization (Singapore Economic Development Board, 2020). Each dimension is assessed through questions reflecting the actual school context, using a Likert scale of 0–4 with distinct descriptors for readiness levels. The evaluation is conducted via internal surveys and discussions with school management, teachers, and staff. Beyond serving as a measurement tool, SERI functions as a diagnostic instrument that highlights institutional strengths. Aligned with the principle of asset-based development, it empowers schools through their internal potential, providing not only readiness levels but also strategic insights into dimensions that can serve as foundations for smart school transformation.

### Strategic Prioritization

The second stage of this study is strategic prioritization, conducted through the TIER Framework of the Smart Industry Readiness Index (SIRI). This framework identifies the most impactful dimensions to be prioritized in schools' short-term strategies. TIER is built upon four core principles Today's State, Impact to Bottom Line, Essential Objectives, and References to the Broader Community which collectively provide comprehensive conceptual guidance for systematically organizing digital transformation priorities. To operationalize these principles, the study employs a Prioritisation Matrix, enabling schools to select key transformation areas by considering relevant contextual factors. The calculation formula applied in the matrix is as follows:

$$iv = W_C \cdot [DOR_c \cdot Cost\ Profile]_i + W_k \cdot [DOR_k \cdot TOP\ KPIs]_i + W_p \cdot [BIC - AMS]_i$$

| | | | |
|---|---|---|---|
| iv | : impact value | $DOR_c$ | : Degree Of Relevance (Cost) |
| w | : weightage assigned to the factor | $DOR_k$ | : Degree Of Relevance (KPI) |
| BIC | : Industry Best in Class Bencmark | | |

To illustrate the calculation process, one dimension is presented as an example. For the Teaching & Learning Process (P5), the cost profile was 2, KPI relevance was linked to Graduate Competency Standards, and the proximity factor compared to the General Manufacturing benchmark was 1. Using the Prioritisation Matrix formula:

$$iv = 0.60 \cdot [DOR_c \cdot Cost\ Profile]_i + 0.20 \cdot [DOR_k \cdot TOP\ KPIs]_i + 0.20 \cdot [Proximity]$$

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Subtituting the values:

$$iv = 0.60 \cdot [3 \cdot 0.02] + 0.20 \cdot [3 \cdot 1] + [0.20 \cdot 1]$$

$$iv = 0.036 + 0.60 + 0.20 = 0.836$$

This demonstrates how the matrix translates readiness scores into impact values, ensuring that the methodology is transparent and replicable.

**Design of Smart School Technology Architecture**

The final stage of this study is the design of smart school technology architecture and applications, based on the outcomes of the SERI assessment and TIER prioritization. The identified strengths are mapped into architectural components using ArchiMate, an enterprise architecture modeling tool that enables modular and integrated visualization. ArchiMate clarifies both the AS-IS condition with its deficiencies and the TO-BE design supported by Business Information Systems (BIS), thereby guiding digital transformation through enterprise architecture (Lukáš & Brabec, 2025). As noted by (Zhi & Zhou, 2022), ArchiMate is effective in enhancing visualization, transforming system metamodels, and reconstructing scenarios through established modeling procedures. The design covers two main aspects: technology architecture, which illustrates the school's digital infrastructure, and application architecture, which integrates information systems for learning and management. This approach ensures sustainability while providing flexibility for schools to develop digital ecosystems tailored to local needs yet aligned with global standards.

## RESULT

Based on research involving 40 educators and education staff regarding schools' readiness for digital transformation in the context of the Fourth Industrial Revolution, raw data were obtained through the SERI Assessment Matrix. These data cannot be directly interpreted without analytical support. To derive meaningful insights, the study employs the Prioritisation Matrix from the Smart Industry Readiness Index (SIRI). This matrix serves as a tool to translate the assessment results provided by educators and staff into strategic priorities for digital transformation.

**Company Input**

The initial stage in the Prioritisation Matrix is the company input, which provides the foundation for subsequent calculations and strategic analysis. At this stage, all SERI assessment scores are systematically entered into the matrix format, representing the school's digital readiness profile across 19 dimensions. The assessment involves all teachers and educational staff, ensuring that both pedagogical and organizational aspects are captured. This approach aligns with the Smart Education Readiness Index (SERI) Framework developed by SEAMEO VOCTECH, which emphasizes the integration of teaching, learning, technology, and organizational policies in preparing institutions for digital transformation.

Schools must define operational cost categories as percentages totaling 100%, ensuring that financial considerations are integrated into the prioritisation process. This reflects the principle that digital transformation must be both pedagogically relevant and financially sustainable, particularly in non-metropolitan schools with limited resources. KPI factors are represented by the eight national education standards established by the Indonesian government, serving as benchmarks for institutional performance and quality assurance. By integrating KPI factors into the matrix, schools ensure that their strategies are aligned with broader educational goals. Finally, the planning horizon and benchmark are selected to provide realistic, context-sensitive references, ensuring that the matrix is grounded in the practical realities of the education sector.

It is important to clarify that the average SERI score of 3.12 (scale 0–4) reported in the abstract represents the overall mean across all respondents and dimensions. Meanwhile, the tables in this section display dimension-specific scores that have been normalized and weighted through the Prioritisation Matrix. These values may appear lower because they incorporate cost factors, KPI relevance, and proximity to benchmark standards. Thus, the difference between the raw average score and the dimension-specific values reflects methodological conversion rather than inconsistency, ensuring that the interpretation of SERI results remains consistent across the abstract, tables, and conclusion.

Table 1. Company Input

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| Assessment Matrix / Dimension | Score | Cost Categories as a Percentage of Annual Revenue | | Top KPI Categories (Select 5) | |
|---|---|---|---|---|---|
| (P1) General / Transversal Skills | 2 | Labour | 55% | **Graduate Competency Standards** | √ |
| (P2) Specific / Specialised Skills | 1 | Utilities | 10% | Content Standards | |
| (P3) Industry | 1 | Maintenance & Repairs | 5% | **Process Standards** | √ |
| (P4) Non – Industry | 1 | Marketing & Promotion | 1% | **Educational Assessment Standards** | √ |
| (P5) Teaching & Learning Process | 2 | Major Renovations | 2% | **Educational Personnel Standards** | √ |
| (P6) Assessment | 2 | Training Development | 5% | **Facilities and Infrastructure Standards** | √ |
| (T1) Digital Infrastructure Readiness | 2 | Taxes | 1% | Management Standards | |
| (T2) Digital Storage | 2 | Scholarship | 1% | Financing Standards | |
| (T3) Automation | 2 | Consumable | 20% | | |
| (T4) Machine Learning | 2 | | | | |
| (T5) Innovative Analysis | 2 | | | | |
| (T6) Risk & Cyber Security Management | 2 | | | | |
| (T7) Digital Interconnectivity | 2 | | | | |
| (O1) Embedded IR 4.0 framework in organisation's purpose, vision & mission | 2 | Planning Horizon (Select 1) | | | |
| (O2) Policies the guide institution to adapt IR 4.0 related technologies | 2 | Strategic | | | |
| (O3) Plans to implement IR 4.0 related technologies | 2 | Tactical | | | |
| (O4) Current workforce is capable to adopt IR 4.0 related technologies | 2 | **Operational** | √ | | |
| (O5) Training plans in place to develop our workforce's capabilities, skills and competencies | 2 | | | | |
| (O6) Capable task force to drive IR 4.0 integration | 2 | | | | |

| Industry Best-in-Class Benchmark (Select 1) | | | | | | |
|---|---|---|---|---|---|---|
| Aerospace | Automotive | Electronics | Energy & Chemicals (Downstream) | Food & Beverage | **General Manufacturing (√)** | Logistics |
| Oil & Gas (Upstream) | Machinery & Equipment | Medical Technology | Pharmaceuticals | Precision Parts | Semiconductors | Textile, Clothing, Leather & Footwear |

**DOR (Degree Of Relevance)**

The Degree of Relevance (DOR) is employed to measure the alignment between cost categories and key performance indicators (KPIs) with the 19 dimensions of schools' digital readiness. Two types of DOR are applied in this study, namely DOR Cost and DOR KPI. The evaluation is conducted using a structured framework to

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determine whether operational costs and KPIs are directly linked to each SERI dimension. The assessment criteria consist of three levels:

- 0 = Negligible
- 1 = Small and/or Indirect
- 3 = High and direct

In addition to the DOR evaluation, the raw values obtained from the cost factor, KPI factor, and proximity are averaged to produce normalized data. This normalization process ensures that the values are comparable across different dimensions and categories, thereby reducing bias and enhancing analytical consistency. The normalized data are then re-applied within the Prioritisation Matrix to calculate the impact value, which serves as the basis for identifying the most strategically relevant dimensions for short-term planning.

Through this methodological refinement, the prioritisation process not only captures the degree of relevance between costs, KPIs, and readiness dimensions but also ensures that the resulting impact values are statistically balanced. This provides a more reliable foundation for decision-making, enabling schools to align financial considerations, performance indicators, and contextual proximity in a structured and evidence-based manner.

**Best in Class (BIC) Benchmark**

The subsequent phase is determining the Best in Class (BIC) Benchmark, which involves comparing the school's assessment results with the best standards from other institutions demonstrating superior performance. In this BIC Benchmark, the objective is to obtain the proximity factor by subtracting the values of the selected general manufacturing benchmark from the assessment matrix scores. The resulting difference represents the proximity factor, which indicates the extent of the gap between the school's current condition and the benchmark. In this way, schools can identify dimensions that require improvement while also understanding their relative position within the broader context of digital transformation in education. The results of the BIC Benchmark are presented in the following table.

Table 2. Proximity Factor

| Dimension | Process | | | | | | Technology | | | | | | | Organisation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P 1 | P 2 | P 3 | P 4 | P 5 | P 6 | T 1 | T 2 | T 3 | T 4 | T 5 | T 6 | T 7 | O 1 | O 2 | O 3 | O 4 | O 5 | O 6 |
| General Manufacturing | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 |
| Assesment Matrix Score | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Proximity Factor | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

After obtaining scores for each dimension, the subsequent phase is to conduct a summary. This summary represents the final process of the Prioritisation Matrix, highlighting the dimensions with the highest impact values. In this study, the calculation is performed using the TIER formula, which assigns 60% to cost factors, 20% to KPI factors, and 20% to proximity factors. The resulting computation produces an impact value for each of the 19 dimensions of schools' digital readiness, thereby identifying those dimensions that exert the greatest influence on the digital transformation strategy.

Table 3. Impact Value

| Dimension | Process | | | | | | Technology | | | | | | | Organisation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P 1 | P 2 | P 3 | P 4 | P 5 | P 6 | T 1 | T 2 | T 3 | T 4 | T 5 | T 6 | T 7 | O 1 | O 2 | O 3 | O 4 | O 5 | O 6 |

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| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Impact Value | 0.07365 | 0.06703 | 0.06042 | 0.05198 | 0.09621 | 0.08193 | 0.03535 | 0.0213 | 0.02052 | 0.03129 | 0.07678 | 0.02147 | 0.01892 | 0.02355 | 0.05319 | 0.02355 | 0.02149 | 0.02329 | 0.01969 |

To determine the school's plan based on the TIER Framework, the dimensions with the highest impact values are selected from each block—process, technology, and organization. From the remaining dimensions, one with the highest score is added as the fourth strength. Consequently, the prioritization results in four core dimensions that serve as the foundation for the school's short-term strategy in addressing digital transformation. The results of the impact value can be seen in the diagram below, where the highest-scoring dimensions represent the school's key strengths.

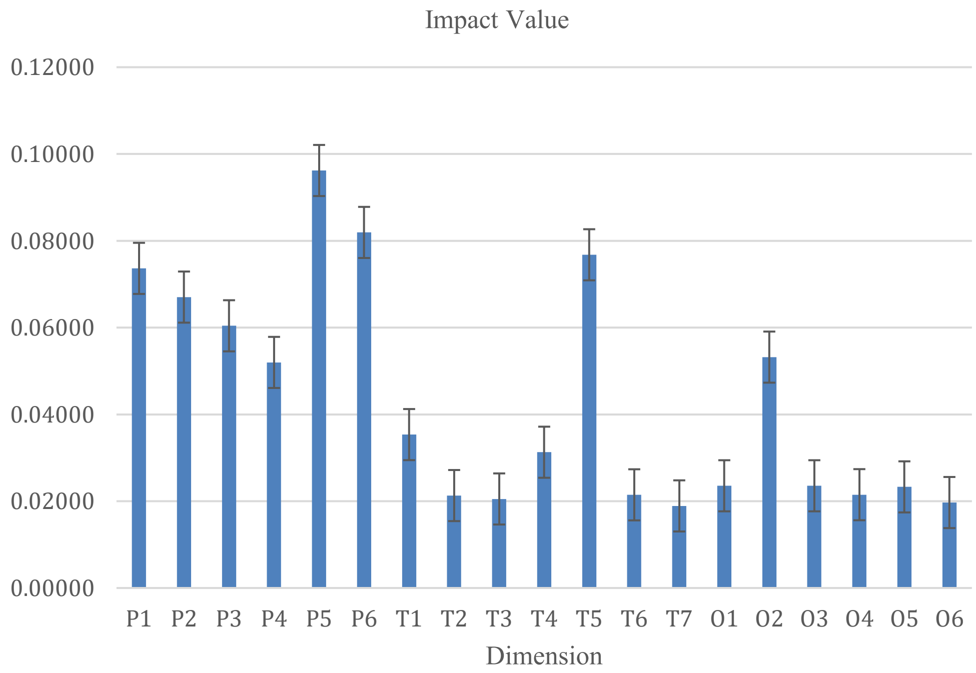


Fig. 2 Result of Prioritisation Matrix Based on Impact Value

Based on the impact value results, the school has identified four core dimensions of strength, which were selected through the prioritisation process of the TIER Framework. These dimensions ensure that the most influential factors from the process, technology, and organization blocks are represented. Specifically, the strengths include the Teaching and Learning Process and Assessment dimensions under the process block, Innovative Analysis under the technology block, and Policies that guide institutions to adapt IR 4.0-related technologies under the organization block. Together, these four dimensions provide a structured foundation for the school's short-term digital transformation plan, aligning local readiness with global standards.

**Application Architecture and Technology Architecture**

Based on the results of the prioritisation matrix, the school demonstrates strengths in four dimensions distributed across three blocks. These four dimensions can be elaborated as a short-term plan, which is illustrated in the image shown below. The image was generated using the ArchiMate application and is derived directly from the impact value analysis, providing a structured visualization of the school's core strengths in supporting its digital transformation strategy.

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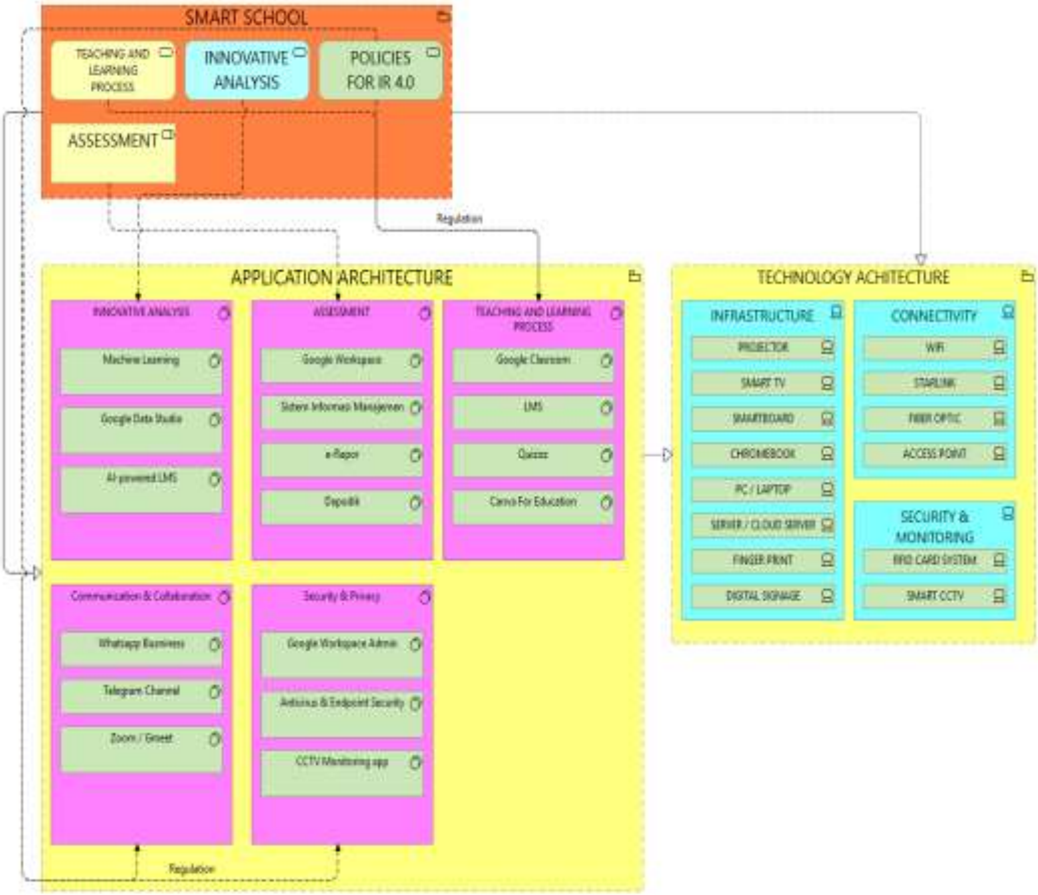


Fig. 3 Application Architecture and Technology Architecture

Figure 3 illustrates the smart school architecture using ArchiMate, structured into three layers: Smart School, Application Architecture, and Technology Architecture. Smart School Layer highlights the four prioritized dimensions—Teaching & Learning Process, Assessment, Innovative Analysis, and IR 4.0 Policy which serve as the strategic foundation identified through the Prioritisation Matrix.

Application Architecture Layer maps these dimensions into specific applications. For example, Teaching & Learning Process is supported by Google Classroom, LMS, Quizziz, and Canva for Education; Assessment is facilitated by Google Workspace, e-Rapor, and Dapodik; Innovative Analysis is enabled through Machine Learning, Google Data Studio, and AI-powered LMS; while IR 4.0 Policy is operationalized through communication and collaboration tools such as Zoom, Gmail, and Telegram.

Technology Architecture Layer provides the infrastructure and connectivity required to sustain these applications, including smart devices (projectors, smart boards, Chromebooks), servers and cloud systems, and secure connectivity via WiFi, fiber optic, and Starlink. Security and monitoring are ensured through RFID card systems and smart CCTV.

The relationship between layers demonstrates how institutional priorities are translated into applications and supported by technology infrastructure. This layered explanation clarifies the linkage between the prioritisation results and the proposed architecture, ensuring that the visualization is both transparent and replicable.

## DISCUSSIONS

Based on the assessment and data processing results, the school's primary strengths are identified in four dimensions: Teaching & Learning Process, Assessment, Innovative Analysis, and IR 4.0 Policy. These dimensions hold the highest impact values compared to the others and are therefore regarded as the strategic foundation for digital transformation. Stakeholders perceive strong potential in instructional processes, evaluation systems, innovative analysis, and supportive policies. However, these areas still need improvement to optimize smart school implementation within 3–6 months.

This research approach is distinctive in that it integrates two cross-sector frameworks: SERI from the field of education and TIER from the industrial sector. The integration of these frameworks provides a novel perspective

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that is rarely employed in previous studies, which typically focus on a single framework. Consequently, this study not only produces a mapping of schools' digital readiness but also formulates a more measurable and relevant prioritization strategy. This strengthens the contribution of the research by offering a contextual approach capable of bridging local needs with global standards.

The research was conducted at a private elementary school that has been established for 35 years in Karo Regency, North Sumatra. Its geographical location in the highlands, with limited access to technology, creates a digital divide compared to schools in major urban areas. Nevertheless, with its existing strengths, the school demonstrates readiness to transform into a smart school in line with the demands of the Fourth Industrial Revolution. The visualization of technology and application architecture using ArchiMate produces a modular and integrated system design, thereby supporting the preparation of the Medium-Term Work Plan and the School Work and Budget Plan. This approach has proven relevant for non-metropolitan schools seeking digital transformation by leveraging their internal potential.

This study has several limitations that should be acknowledged. First, the sample size was limited to 40 educators and staff from a single non-metropolitan school, which restricts the generalizability of the findings. Second, the reliance on self-reported SERI assessment data may introduce subjective bias. Third, the application of ArchiMate modeling was constrained by available resources, and therefore the visualization represents a conceptual design rather than a fully implemented architecture. Future studies should expand the sample across multiple schools and employ mixed-method approaches to strengthen validity and reliability.

## CONCLUSION

Digital transformation in primary education is not merely a process of technologization, but rather a strategic journey that requires a deep understanding of institutional readiness, local context, and national policy direction. This study emphasizes that the success of transformation cannot rely solely on past approaches, as conditions and opportunities have changed significantly (McCarthy et al., 2023).

Through the assessment using the Smart Education Readiness Index (SERI), this study successfully identified four key dimensions with the highest scores: Teaching & Learning Process (3.45), Assessment (3.28), Innovative Analysis (3.21), and IR 4.0 Policy (3.30). The average digital readiness score of the school is 3.12 on a 0–4 scale, indicating a fairly good level of readiness, though further strengthening is still required. These quantitative findings provide the foundation for formulating a short-term strategy that is both realistic and grounded in local strengths. Integration with the TIER Framework through the Prioritisation Matrix reinforces the assessment results by emphasizing cost factors (60%), KPI factors (20%), and proximity factors (20%). This approach enables the school to map strategic priorities in a more structured manner, based on internal potential and aligned with actual needs. Furthermore, the visualization of technology and application architecture using ArchiMate produces a modular, integrated, and sustainable digital system design.

In conclusion, this study offers a smart school architecture model that can be replicated by other schools, particularly those in non-metropolitan areas. By integrating digital readiness analysis, strategic priority mapping, and contextual architectural design, schools are able to establish a foundation for digital transformation that is not only technologically modern but also institutionally sustainable.

The study is limited by the small number of respondents 40 educators and staff so the results may not fully represent diverse school conditions. It also focuses on a single school in Karo Regency, making generalization cautious. Future research should involve more schools from metropolitan and rural areas, adopt longitudinal analysis to track digital readiness over time, and test the effectiveness of smart school architecture in improving learning and management quality.

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