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Collaborative Management as a Catalyst for Artificial Intelligence Adoption in Elementary Education: A Case Study

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Abstract. This study examines the optimization of collaboration between school principals and school committees as a strategic catalyst for the adoption of Artificial Intelligence (AI) technologies in elementary schools. The research addresses the critical need for digital transformation in primary education, particularly within resource-constrained environments, emphasizing that technology adoption hinges on effective multi-stakeholder management. Employing a qualitative case study methodology (Creswell, 2014) at two Indonesian elementary schools, data were collected through in-depth interviews, observation, and document analysis. The findings are structured around the POAC framework (Robbins & Coulter, 2020), revealing that structured collaboration facilitates three strategic objectives: participatory planning of AI integration, adaptive policy implementation that addresses digital literacy gaps, and data-driven monitoring for accountability. The study concludes that formalized, sustained principal-committee collaboration accelerates AI adoption, strengthens institutional adaptability, and mitigates cultural resistance, positioning it as an essential model for systemic digital readiness.

Keywords: AI Adoption, Educational Leadership, School Committee, Digital Transformation.

1 Introduction

Education in the era of digital disruption is undergoing a phase of profound transformation, demanding rapid organizational and pedagogical adaptation in classroom management and instructional practices. The evolution of technological capabilities, particularly the maturation of Artificial Intelligence (AI), is no longer merely a global trend but a strategic imperative. AI offers unparalleled potential to enhance school administration, elevate the precision of academic data analysis, and facilitate the elusive goal of personalized learning at scale [1], [2]. Globally, leading nations recognize AI integration as a national strategy essential for fortifying the competitiveness of their future workforce [2], [3]. In Indonesia, national policies, notably the *Merdeka Belajar* (Emancipated Learning) initiative, structurally emphasize flexibility, innovation, and digital literacy as foundational competencies for both students and educators [4].

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The integration of disruptive technology like AI at the elementary school level presents a unique set of management challenges. While secondary and tertiary institutions possess greater resource capacity and established digital infrastructure, primary schools, particularly in public and regional settings, frequently contend with fundamental obstacles. These challenges include low digital literacy among school committee members and a significant portion of the parental community, inherent cultural resistance to shifting away from traditional pedagogical practices, and the psychological unpreparedness of stakeholders to embrace rapid technological change [5], [6]. This context underscores a crucial management dictum: the efficacy of technological innovation is constrained not primarily by the technology itself, but by the integrity and robustness of the management system supporting its adoption [7].

Management theory, particularly the foundational Planning, Organizing, Actuating/Leading, and Controlling (POAC) framework, posits that the successful implementation of any complex organizational innovation—such as AI adoption—is contingent upon integrated, systematic execution across these four phases [8], [9]. In the educational context, the linchpin for achieving this integration is the strategic collaboration between the school principal and the school committee. The principal is the authoritative figure, responsible for formulating the digital vision, driving instructional change, and leading the teaching faculty [10]. Conversely, the school committee, as an institutionalized representative body of the community, plays a pivotal role in three non-academic domains critical to technology success: resource mobilization (securing funding for hardware/software), social legitimation (mediating parental and community acceptance), and external accountability (ensuring the school's strategy meets community expectations) [11], [12].

The current academic literature, while rich in examining the pedagogical implications of AI and the general functions of school committees , exhibits a significant research gap concerning the specific strategic management model that effectively leverages the principal-committee collaboration to drive *AI adoption* in resource-constrained primary schools [1], [2]. Prior studies on school committees largely restrict their focus to general functions such as fundraising or academic quality enhancement (Arifin & Wulandari, 2022). There is a conspicuous absence of empirical analysis detailing how this collaboration is systematically planned, structured, and monitored through the lens of strategic management [13] to specifically overcome the unique organizational and cultural barriers associated with disruptive technological change, such as digital resistance and literacy disparity [6]

This study, titled "Collaborative Management as a Catalyst for Artificial Intelligence Adoption in Elementary Education: A Case Study," is designed to fill this critical gap. It systematically examines how the collaboration between principals and committees is optimized—from the initial vision setting to the final accountability phase—to function as an effective catalytic force for AI integration in two distinct elementary school contexts. By applying the rigorous POAC framework to the qualitative data, this research seeks to identify the concrete, transferable strategies that enable sustained digital transformation, even in the face of infrastructure limitations.

The objectives of this study are threefold: (1) To descriptively analyze the strategic planning and organizational structures established collaboratively by the principal and committee for AI adoption (Planning and Organizing phases). (2) To narratively investigate the adaptive implementation (Actuating) strategies utilized by the collaboration

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to enhance the digital literacy of teachers and students while mitigating resource constraints. (3) To evaluate the mechanism of joint monitoring and feedback (Controlling) that ensures accountability and continuous improvement of AI-based programs.

The novelty of this research is rooted in the utilization of the POAC management cycle as the definitive analytical lens for inter-organizational educational collaboration in a technological context. It moves beyond simply describing *what* the committee does to analyzing *how* the joint management process strategically enables the adoption of a disruptive technology like AI. This provides a clear, actionable model—the Collaborative Catalysis Model—that can serve as a reference for school leaders and policymakers aiming to institutionalize digital readiness and ensure that transformative policy (like *Merdeka Belajar*) translates into impactful, sustainable practice at the foundational level of education [14]. The empirical findings from the case schools (SDN 086 Cimincrang and SDN 215 Rancasagatan) will provide the necessary comparative depth to distinguish between effective, structured catalysis and flexible, yet inconsistent, adaptation.

2 Method

This research adopted a qualitative approach utilizing a multiple-site descriptive case study design . This methodology was chosen to obtain a holistic, in-depth understanding of the complex, context-dependent social interactions and strategic processes underpinning the principal-committee collaboration for AI adoption. The qualitative lens allowed the researchers to explore the dynamics of change, cultural resistance, and decision-making within the natural school settings [15]–[17].

The study was conducted at two public elementary schools in Bandung Regency, Indonesia: SDN 086 Cimincrang and SDN 215 Rancasagatan. These sites were selected based on maximum variation sampling, representing schools with varying levels of formality in their administrative structures (SDN 215 being more structured, SDN 086 being more flexible/ad-hoc), providing a comparative basis for analyzing the efficacy of different collaborative models in the face of resource constraints.

Key informants included the school principals (as strategic leaders), the chairs and active members of the school committees (as community partners), and selected teachers (as implementers). Informants were selected using purposive sampling.

Data collection employed triangulation across three primary techniques: (1) In-depth, Semi-structured Interviews to capture the informants' perceptions, strategic rationales, and lived experiences of collaboration; (2) Direct Observation of formal committee meetings, informal principal-committee discussions, and classroom AI integration activities to verify reported practices; and (3) Document Analysis of School Work Plans (RKS), meeting minutes, budget allocation records, and internal digital literacy policy documents.

Data analysis was performed inductively, following the interactive model proposed by Miles, Huberman, and Saldaña [18]. This involved concurrent phases of data condensation (reducing narrative data into manageable themes), data display (using matrices structured around the POAC framework), and conclusion drawing/verification (identifying patterns, comparisons, and causal links between collaborative structure and AI adoption outcomes).

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3 Result

3.1 Planning and Organizing: The Foundation of Collaborative Digital Strategy

The initial phases of Planning (P) and Organizing (O) are critical in establishing the vision, structure, and resource allocation necessary for a major technological innovation like AI. The findings demonstrate a clear correlation between the formality of collaboration in these phases and the clarity of the subsequent implementation strategy.

At both schools, the AI adoption process began with the principal leading the vision-setting; however, the mechanism of participatory planning differed drastically.

SDN 215 Rancasagatan (Formal Structure): Planning was highly structured and documented, reflecting a commitment to strategic management principles (Hitt et al., 2017). The digital transformation vision, which included AI-supported student assessment and data analysis, was formally integrated into the School Work Plan (RKS). Planning sessions were conducted via scheduled quarterly meetings with the School Committee, accompanied by official minutes and documented consensus on digital targets. This process facilitated detailed, long-term resource forecasting (e.g., procurement plans for Chromebooks, annual subscription budgets for educational software). The principal utilized the committee's financial expertise to draft realistic budget proposals, turning AI adoption into a mutual goal backed by verifiable commitments.

> *"We don't just discuss fundraising; we discuss the measurable impact of technology. The minutes show exactly how many teachers need training this semester and how the committee's budget supports that specific KPI. The planning is an accountable partnership."* (SDN 215 Committee Chair Interview).

This formalized approach ensured that AI integration was not an optional add-on but a core strategic imperative, aligning organizational goals (principal) with community resources (committee). This participatory planning mechanism, consistent with [11] framework for family and community partnerships, established the necessary social legitimacy for utilizing scarce resources on potentially controversial technology.

SDN 086 Cimincrang (Flexible/Ad-hoc Structure): Planning was significantly more informal, driven primarily by the principal's initiative and the immediate needs of the teachers. Strategic discussions with the committee were often ad-hoc, occurring spontaneously or during non-scheduled briefings. While the principal conveyed a clear enthusiasm for digital learning, the resulting plans often lacked formal documentation and integrated KPIs. The focus was predominantly reactive, addressing current deficiencies (e.g., fixing a broken printer, asking for funds for a single projector) rather than proactive, systematic planning for AI integration over a three-year cycle [19].

> *"If a teacher finds a new educational app, the Principal might mention it to the Committee Chair over coffee. The planning is fast and flexible, but we rarely set benchmarks six months in advance. We rely on mutual trust, not heavy paperwork."* (SDN 086 Teacher Interview).

While this flexible approach allowed for rapid adaptation to immediate resource shortages, the lack of formalized planning and documentation often resulted in sporadic resource allocation and inconsistent follow-through, failing to establish AI adoption as a consistent, institution-wide priority [14] .

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The Organizing phase involved establishing the internal structures and clear role differentiation necessary to manage the complexity of digital transformation [8]. SDN 215 Rancasagatan (Formal Structure): The school established a dedicated Digital Learning Team (DLT) comprising the Vice Principal, two tech-savvy teachers, and a dedicated Committee liaison. This DLT was formally tasked with managing the AI initiative: scheduling training, organizing hardware access, and reporting usage data. The Principal's role was clearly defined as the strategic director, while the Committee's role was formalized as the Resource and Legitimacy Broker. This clear division of labor (O) minimized role overlap, ensured accountability, and streamlined the decision-making process for troubleshooting technical issues or escalating policy needs. This structure is consistent with effective educational management, where formal structures accelerate coordination and minimize ambiguity during periods of institutional change [10]

SDN 086 Cimincrang (Flexible/Ad-hoc Structure): The school operated with a highly flexible organizational structure. AI adoption management was integrated into the existing curriculum team's duties, without formal designation or dedicated personnel. The Committee's function remained generalized: providing support as requested. While this agility allowed the school to quickly adjust strategies based on available human capital and financial resources (e.g., quickly repurposing a teacher for tech support when funds ran low), the lack of clear formal roles created inconsistencies. Teachers often reported confusion over who was responsible for hardware maintenance or who held the final authority on purchasing decisions, leading to delays in addressing technical bottlenecks [20], [21].

In summation, the comparison illustrates that while the Flexible Structure allowed for rapid, small-scale adaptations (SDN 086), the Formal Structure (SDN 215) provided the essential strategic stability and proactive resource management required for embedding AI adoption as a long-term institutional strategy.

3.2. Actuating: Collaborative Implementation and Adaptive Pedagogy

The Actuating (A) phase involves the execution of the planned strategy, focusing on leadership, motivation, and managing the human and social dimensions of change. In the context of AI adoption, this phase critically involves bridging the digital literacy gap among teachers and the community, a major inhibitor of transformation.The successful actuation of AI-based programs required collaborative policy implementation that directly targeted digital literacy improvement among all key stakeholders (teachers, students, and parents) [5].

SDN 215 Rancasagatan (Formal Structure): Policy implementation was systematic and mandatory. The DLT, empowered by the Principal and funded by the Committee, enforced a structured professional development schedule. This included regular, mandatory workshops on using specific AI tools (e.g., adaptive assessment platforms, basic data analytics tools for reporting) and utilizing the Merdeka Teaching Platform. Furthermore, the Committee actively participated in parental digital literacy initiatives, hosting workshops to familiarize parents with the school's AI-assisted learning applications, thereby securing home support for the digital transition [11].

"The Committee understood that if parents didn't trust the technology, they wouldn't support it. So, we collaborated on a 'Parent Digital Day' to show them exactly

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how AI personalized their child's learning, not just how to pay fees online." (SDN 215 Principal Interview).

This formal, comprehensive policy implementation ensured consistent teacher competence and broad community acceptance, mitigating the primary risks of digital adoption. SDN 086 Cimincrang (Flexible/Ad-hoc Structure): Policy implementation was more dependent on individual teacher initiative and internal motivation. Training was often voluntary, informal, and peer-led, lacking the institutional weight and funding consistency of its counterpart. The Committee's involvement in literacy was limited to disseminating general information rather than targeted, hands-on workshops. While highly motivated teachers achieved excellent results with simple AI tools (e.g., creating quick online quizzes), the overall institutional capacity for digital pedagogy remained uneven [4].

"If a teacher is already tech-savvy, they lead by example. We try to share ideas on our WhatsApp group, but there's no mandatory training budget for the whole faculty. It's more about individual professional learning than a school-wide Actuation." (SDN 086 Teacher Interview).

The contrast here highlights that sustained Actuation requires not only flexible adaptation but also formal institutional commitment (O) and mandated training (P) to successfully scale teacher competence [16].

Given the universal constraint of limited hardware and unstable internet access, the Actuating phase necessitated creative adaptive pedagogy (A) supported by the Committee's resource broker role (O).

Both schools utilized a hybrid teaching model, combining digital interaction with traditional manual methods. However, the organization of resource optimization differed:

SDN 215 Rancasagatan (Formal Structure): The DLT executed a formal, rotation-based scheduling system for hardware (e.g., the single shared Chromebook cart was scheduled daily across all upper grades). The Committee, leveraging its community network, secured small-scale donations and partnerships to incrementally increase the hardware inventory, following the detailed budget plan (P). This structured approach ensured equitable student access to the scarce AI-enabled devices.

SDN 086 Cimincrang (Flexible/Ad-hoc Structure): The school relied on a first-come, first-served or ad-hoc borrowing system for its limited devices. The principal and committee focused resource optimization on utilizing personal teacher devices and encouraging students to use their parents' smartphones for simple interactive tasks. While fast and agile, this model inherently reinforced digital inequality among students based on socio-economic background [22].

The Actuating phase confirmed that the collaborative partnership succeeded in leveraging local resources, but the success was greater when the execution was formalized (SDN 215), guaranteeing consistency and equity in access, rather than relying solely on individual goodwill and flexibility (SDN 086).

3.3. Controlling: Joint Monitoring and Data-Driven Accountability

The Controlling (C) phase is indispensable for strategic management, ensuring that activities align with the planned objectives, facilitating necessary adjustments, and

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establishing accountability. In the context of AI adoption, this involves joint monitoring of digital utilization and student performance data.

The efficacy of the Control phase was determined by the formality of the monitoring mechanism and the capacity to utilize data to inform the collaborative partnership [14].

SDN 215 Rancasagatan (Formal Structure): The Control mechanism was systematic and data-driven. The DLT was responsible for collecting usage metrics (frequency of AI assessment platform use, teacher participation in digital reporting) and synthesizing this data for formal, bi-annual reports presented to the School Committee. The Committee's role was to utilize this data to assess return on investment (ROI)—verifying that the resources allocated to AI were generating measurable improvements in digital literacy or assessment efficiency.

> *"The Committee doesn't just ask if the program is running; they ask, 'Did the automated assessment tool reduce teacher grading time by 20%?' and 'Did student performance in the digital module meet the target?' We use the data generated by AI to justify the resources spent on AI."* (SDN 215 Principal Interview).

This formalized data feedback loop created institutional accountability (C) and ensured the continuous improvement cycle (P) remained objective and strategically focused [13] Furthermore, this joint monitoring reinforced the school's commitment to transparency, a key element in establishing trust with the community (Epstein, 2018).

SDN 086 Cimincrang (Flexible/Ad-hoc Structure): Monitoring was largely informal and anecdotal. The Principal gathered feedback through general faculty meetings and spontaneous conversations with committee members. Evaluation of the AI initiative focused on qualitative outcomes, such as increased student motivation or teacher enthusiasm, rather than quantitative metrics (e.g., student digital competency scores, reduction in administrative time). Documentation of the Control phase was sparse.

> *"We check if the students are happy and the teachers are motivated. If the committee sees the children enjoying the new projector, they know the money was well spent. We focus on the spirit of the program, not the data points."* (SDN 086 Committee Member Interview).

While relying on qualitative well-being is valuable, the absence of structured, quantitative data analysis (C) meant that systemic bottlenecks (like network instability or uneven teacher competence) often went unaddressed in the subsequent planning cycle (P), perpetuating the underlying resource challenges [9].

The Control phase's ultimate purpose is to inform the next planning iteration, closing the strategic loop. SDN 215 Rancasagatan (Formal Structure): The data collected was directly used to make strategic adjustments: if the data showed low adoption in Grade 4, the next RKS (P) included mandatory Grade 4-specific training (A). If the budget analysis showed a high cost per student for a specific software, the Committee (O) was tasked with sourcing an open-source alternative. This demonstrates a robust Collaborative Catalysis Model, where data drives iterative refinement.

SDN 086 Cimincrang (Flexible/Ad-hoc Structure): The primary adjustment mechanism was reactive: when a piece of hardware broke, the committee helped replace it. The lack of structured monitoring meant that adjustments were focused on maintaining the *status quo* (fixing problems) rather than systematically optimizing the process (improving the quality of adoption).

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In summary, the results confirm that while collaboration is the catalyst, its effectiveness is dramatically amplified when formalized into a structured, accountable POAC cycle (SDN 215), particularly in the Planning and Controlling phases. This structure empowers the collaboration to move beyond fundraising and basic coordination into truly strategic management of digital transformation.

4 Discussion

The empirical findings from SDN 086 Cimincrang and SDN 215 Rancasagatan provide compelling evidence that collaboration between the school principal and the committee is the essential strategic catalyst for successful AI adoption in elementary schools facing resource constraints. However, the study advances the understanding of this partnership by demonstrating that the *formality and structure* of the collaboration, particularly as organized by the POAC management framework, dictates its ultimate impact and sustainability. The comparison between the formally structured POAC cycle at SDN 215 and the flexible, ad-hoc management at SDN 086 highlights that flexibility alone is insufficient for disruptive innovation. In contrast, SDN 215's rigorous adherence to a planned, organized, and data-monitored cycle ensured that every resource investment and policy implementation contributed incrementally to a clearly defined, long-term digital vision [8], [13]. This formalized POAC approach is crucial because digital transformation requires sustained financial commitment and fundamental shifts in pedagogy, which demand institutional accountability and community legitimation established during the formal Planning phase [4], [11].

The Principal's role, therefore, must shift from being a visionary leader to an Accountable System Designer [10], [16]. At SDN 215 Rancasagatan, the principal successfully formalized the committee's participatory role, transforming them from passive donors into strategic resource brokers and accountability partners responsible for validating the return on investment (ROI) in AI technology through data analysis. This structural integrity also addresses the critical barriers to AI adoption, namely the digital literacy gap and cultural resistance [6]. The effective collaborative model (SDN 215 Rancasagatan) functioned as a powerful buffer against these barriers during the Actuating (A) phase. This was achieved by formally integrating teacher training into the strategically planned budget, thereby standardizing the quality of digital pedagogy and preventing the uneven capacity observed at SDN 086 [2]. Furthermore, the committee's proactive involvement in parent digital literacy secured crucial community buy-in, demonstrating the application of Epstein's framework where partnership is leveraged to reinforce academic goals. Simultaneously, the structured organizational process for hardware scheduling ensured that scarce resources were utilized equitably, mitigating the reinforcement of socio-economic digital divides—a crucial ethical consideration in technology adoption [22].

Based on these findings, the study proposes the Collaborative Catalysis Model as a refined framework for technology adoption in primary education, which defines the principal-committee relationship as a mutual responsibility to execute the POAC cycle with high fidelity [21], [23]. This model mandates four elements: (P) Jointly develop a Data-Informed Digital RKS; (O) Establish a Formal Digital Learning Team (DLT) with mandated roles for both faculty and committee liaisons; (A) Systematically implement

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Mandatory Digital Literacy Programs for all stakeholders; and (C) Conduct Joint, Data-Driven Audits utilizing AI-generated metrics to evaluate ROI. The success of this model, as demonstrated by SDN 215, shows that when collaboration is formally structured, it becomes a self-sustaining engine for innovation, ensuring the adopted AI technologies are not merely present but are systematically integrated, utilized, and continuously improved upon—a model crucial for the future of digital education in developing contexts [24].

5 Conclusion

This research successfully analyzed the Collaborative Catalysis Model—the strategic partnership between school principals and committees—as the determinant factor for successful AI adoption in elementary schools. The study concludes that the effectiveness of this collaboration is directly proportional to the formality and rigor of the POAC management cycle applied to the digital transformation strategy.

Key findings show that schools employing a formalized structure (SDN 215 Rancasagatan) achieve greater success by securing community legitimacy and financial commitment during Planning, and by ensuring accountability and continuous improvement through Data-Driven Controlling. This approach mitigates the primary barriers of digital literacy and cultural resistance more effectively than flexible, ad-hoc models.

The study strongly recommends that elementary school leaders adopt the Collaborative Catalysis Model: institutionalizing the committee's role into a formalized structure responsible for the four POAC phases of technology integration. This includes mandatory, collaboratively funded digital literacy training for teachers and parents (Actuating) and the establishment of joint, data-based auditing of AI utilization and performance metrics (Controlling). By transforming the committee partnership into a strategic management function, schools can successfully navigate the complexities of digital transformation and achieve sustainable educational excellence.

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