



## Human-Mediated AI in Educational Management: Authority, Ethics, and Accountability

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### Abstract

Artificial intelligence is increasingly used to support educational management, yet limited empirical attention has been paid to how managers retain authority when AI-generated information enters consequential decisions. This study analyzed how educational managers interpreted, verified, accepted, modified, or rejected AI-generated recommendations while maintaining human agency, professional responsibility, contextual discretion, and ethical judgement. An interpretive qualitative multiple-case study was conducted in three public junior secondary schools in Pidie Regency, Aceh, involving 14 adult institutional actors. Data were collected through semi-structured interviews, observations, and institutional documents and analyzed thematically within-case and cross-case comparisons. The findings showed that AI functioned as decision support rather than as an autonomous decision-maker. Its outputs acquired managerial relevance through four interconnected forms of human mediation: interpretation, verification, contextualization, and intervention through acceptance, supplementation, modification, or rejection. Human responsibility remained identifiable because school personnel retained authority over the evidentiary and contextual suitability of AI outputs. The study refines human-mediated algorithmic management as a process-oriented account of meaningful human control and highlights the need for institutional procedures that document verification, contextual considerations, and reasons for using or altering AI-generated information.

## A. Introduction

Approximately 2.6 billion people remained offline in 2024, yet artificial intelligence (AI) systems are already influencing educational risks, resource priorities, and institutional decisions for populations whose realities may be incompletely represented in digital data (ITU, 2024; Alfredo et al., 2024; Wolf, 2025). This contradiction reveals a deeper crisis: AI can generate recommendations faster than educational institutions can establish who should interpret, contest, and remain accountable for them (Mouta et al., 2025; Tavolzhanskyi et al., 2025). By processing extensive datasets, AI can identify patterns, predict outcomes, and support decisions that previously required prolonged human analysis (Shahzad et al., 2024). However, the growing authority of these systems may obscure the assumptions embedded in their outputs and weaken the visibility of human responsibility (Korteling et al., 2021; Walter, 2024; Nguyen, 2025; Chaaban et al., 2025). UNESCO (2026) therefore positions human agency and institutional accountability as central concerns in the transformation of education through AI (Zhai, 2025).

Within educational management, AI is increasingly used to support administration, information management, resource allocation, performance monitoring, and decision preparation (Saini et al., 2025; Wang et al., 2023; Alfredo et al., 2024). Automated systems can reduce routine workloads and allow professionals to concentrate on complex responsibilities (Xia et al., 2024; Zhai et al., 2021; Zhai, 2025). Nevertheless, computational efficiency does not automatically produce educationally responsible decisions (Mouta et al., 2025). Managerial choices concern students, teachers, institutional priorities, and unequal social conditions that cannot always be translated into measurable variables (Chaaban et al., 2025; Wolf, 2025). When algorithmic recommendations are treated as neutral evidence, incomplete data, contextual differences, and historically embedded inequalities may be converted into apparently objective managerial judgments (Albarracín Vanoy, 2023; Wolf, 2025).

Recent scholarship has developed along several interconnected trajectories. Adoption studies explain how readiness, infrastructure, perceived usefulness, facilitating conditions, and user motivation shape AI acceptance (Zhai, 2025; Wolf, 2025; Zhai, 2025; Hamzah et al., 2026). Application-oriented research demonstrates AI's capacity to support personalized learning, automated recognition, feedback, and data-driven services (Delilah et al., 2025; Vorobyeva et al., 2025; Ayeni et al., 2024; Alfredo et

al., 2024; Chaaban et al., 2025). Educational-management studies extend this discussion by linking AI to service efficiency, institutional marketing, strategic adaptation, and sustainable digital transformation (Muin et al., 2026; Ulfah et al., 2026; Mouta et al., 2025). Collectively, these studies establish that AI adoption is neither purely technical nor individually determined; it depends on organizational capacity, managerial planning, professional competence, and the alignment between technological functions and educational purposes.

A second trajectory has shifted attention from adoption to responsible use. Research emphasizes AI literacy, evaluative judgment, transparency, fairness, privacy, academic integrity, and value-sensitive engagement (Syamsudduha et al., 2026; Walter, 2024). Humanistic models similarly position AI as an enabling instrument while retaining human values at the center of organizational development (Shofiyah & Muhtarom, 2026). This literature converges with Human-Centered AI (HCAI), which prioritizes agency, dignity, and accountability, and with emerging educational frameworks that demand professional responsibility and critical oversight (Abrar et al., 2025; Castro et al., 2024). These perspectives clarify why AI outputs require ethical scrutiny, but they primarily articulate principles, competencies, and institutional conditions rather than demonstrating how managerial authority is exercised during actual decision processes.

A third trajectory examines algorithmic decision-making, automation bias, professional discretion, and human-in-the-loop governance. This work shows that algorithmic systems can redistribute organizational influence and reshape professional judgment even when final authority formally remains with humans (Jarrahi et al., 2021). Human involvement may range from substantive verification to passive endorsement; consequently, the mere presence of a manager does not establish meaningful human control (de Sio & van den Hoven, 2018; Mecacci & Santoni de Sio, 2020). Sociotechnical research further demonstrates that control emerges through relations among actors, technologies, organizational rules, and institutional values rather than through a simple division between human and machine (Kudina & van de Poel, 2024).

Despite these advances, the literature leaves a consequential threefold gap. Conceptually, adoption, ethical governance, and human oversight are usually treated as separate concerns, leaving the mechanism connecting algorithmic output to managerial authority insufficiently specified. Empirically, research largely measures acceptance, literacy, readiness, or learning outcomes, while offering limited evidence of what educational

managers actually do when an AI recommendation conflicts with contextual knowledge, institutional values, or professional responsibility. Analytically, “human-in-the-loop” frequently functions as a procedural safeguard without distinguishing meaningful scrutiny from ceremonial approval. This blind spot prevents existing frameworks from explaining when human involvement genuinely preserves agency and when it merely legitimizes algorithmic influence.

This study addresses that gap by conceptualizing human-mediated algorithmic management as the mechanism through which AI-generated information acquires, loses, or changes its influence over educational decisions. Its novelty lies in moving the analysis from whether humans remain involved to how managers enact authority through interpretation, verification, contextualization, selective acceptance, modification, and rejection. By integrating HCAI with Sociotechnical Systems Theory, the study connects individual judgment to organizational structures, institutional values, and technological arrangements. It therefore distinguishes formal human presence from meaningful human control and explains professional discretion as an observable managerial practice rather than an abstract ethical requirement.

Accordingly, this study aims to analyze how educational managers across three junior secondary schools interpret, verify, accept, modify, or reject AI-generated recommendations while maintaining human agency, professional responsibility, contextual discretion, and ethical judgment.

## **B. Method**

This study employed a qualitative multiple-case study with an interpretive approach to examine how AI functions as a decision-support instrument and how educational managers maintain human agency, professional discretion, responsibility, and ethical judgment (Vieriu & Petrea, 2025). The design was appropriate for exploring how managers interpret, evaluate, and respond to AI-supported information within institutional contexts. The three schools were treated as bounded cases, enabling within-case analysis followed by systematic cross-case comparison of similarities, differences, and contextual variations in human managerial authority.

The research was situated in junior secondary schools in Pidie Regency, Aceh. Three public schools—SMP Negeri 1 Muara Tiga, SMP Negeri 2 Muara Tiga, and SMP Negeri 1 Delima—were purposively selected as case locations representing different

institutional and digital conditions. Public records reported 289 students and 45 teachers and educational personnel at SMP Negeri 1 Muara Tiga; 218 students, nine study groups, and no recorded Internet access at SMP Negeri 2 Muara Tiga in the 2024/2025-2 semester; and 309 students, 34 teachers, and wireless and broadband access at SMP Negeri 1 Delima. Because December 2025 fieldwork documented AI-supported activities at SMP Negeri 2 Muara Tiga, its earlier connectivity record was treated as historical. Identified technologies included ChatGPT, Google Gemini, Microsoft Copilot, Canva AI/Magic Write, Google Workspace AI, and Grammarly.

Fourteen informants were purposively selected for their roles in AI-supported educational management (Abubakar et al., 2019): three principals, three vice-principals, three senior teachers, three IT administrators, and two school committee representatives. Data were collected in December 2025 through semi-structured interviews, observations, and institutional documents. Interviews examined AI use, generated recommendations, verification, managerial responses, authority, accountability, and ethical judgment. Observations and documents traced how AI outputs entered managerial processes and supported source triangulation. AI was operationalized as a computational system that generates, organizes, predicts, classifies, or recommends information considered in managerial or educational decisions; routine digital administration was excluded.

Interview, observational, and documentary data were analyzed thematically across cases using deductive and inductive coding. Deductive codes addressed human agency, algorithmic recommendations, human mediation, professional discretion, authority, accountability, ethical judgment, and the interpretation, verification, acceptance, modification, or rejection of AI-generated information. Inductive coding captured emerging patterns and divergent accounts. Each case was analyzed independently before a case-by-theme matrix compared AI uses, decision contexts, managerial responses, discretion, authority, and responsibility across the three schools. The analysis identified recurring and context-dependent patterns rather than pursuing statistical generalization.

Trustworthiness was strengthened through source triangulation, member checking, peer debriefing, contextualized description, and an audit trail covering data collection, coding, theme development, and cross-case comparison (Donkoh, 2023).

This study involved adult human participants consisting of school principals, vice-principals, senior teachers, IT administrators, and school committee

representatives. No students or other minors were recruited as research participants. Before data collection, each participant received clear information concerning the study's purpose, procedures, recording process, intended use of the data, confidentiality safeguards, voluntary participation, and the right to decline or withdraw without consequence. Informed consent and permission to record the interviews were obtained before participation. Participants' names and other identifying information were removed from interview transcripts, observation records, and institutional documents. The collected data were used exclusively for research purposes. These procedures ensured respect for participant autonomy, privacy, confidentiality, and voluntary participation throughout the research process.

### C. Results and Discussion

The findings were derived from semi-structured interviews with 14 informants, field observations, and institutional documents from SMP Negeri 1 Muara Tiga, SMP Negeri 2 Muara Tiga, and SMP Negeri 1 Delima. The presentation follows the empirical sequence through which AI-generated information entered educational management: the technologies and outputs used, the forms of human mediation applied, and the accountability and ethical considerations accompanying final decisions. Anonymous interview codes are used throughout: P denotes principal, VP vice-principal, T teacher, and IT information-technology administrator; the numerals identify the three cases. Figure 1 summarizes the movement from AI-supported information through human verification to managerial decision-making and ethical accountability.

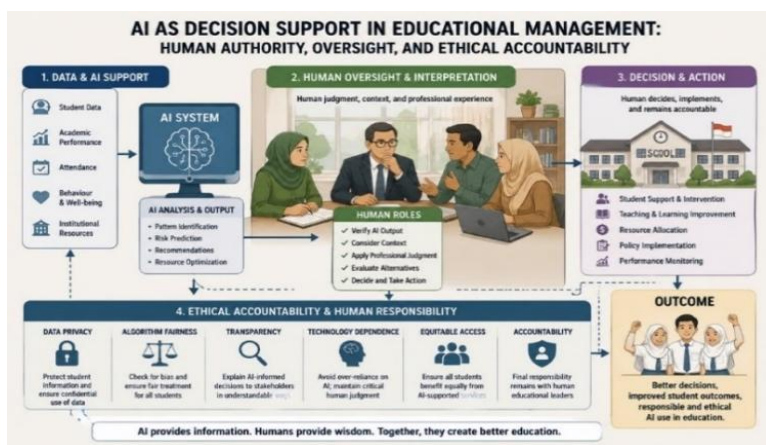


Figure 1. Illustration of Human-Centered AI Integration in Educational Management: Data, Human Oversight, Decision-Making, and Ethical Accountability.

## 1. Results

Across the three schools, AI functioned as decision support rather than as an autonomous decision-maker. School personnel interpreted, verified, contextualized, accepted, modified, or rejected AI-generated information before using it, while accountability and ethical judgment remained with human decision-makers. These patterns were identified through interviews, field observations, institutional documents, and cross-case analysis.

### a. AI as Decision Support in Educational Management

Across the three schools, AI was used to generate text, summarize information, refine language, assist document preparation, support performance monitoring, and provide information for student-related and managerial considerations. Its use varied according to institutional needs, available technologies, and staff roles. The interview, observation, and documentary evidence consistently showed that generated outputs entered decision preparation as supporting information rather than as autonomous decisions. School personnel retained responsibility for determining whether an output was sufficiently accurate, relevant, and contextually appropriate for use. Table 1 presents the technologies, inputs, outputs, decision contexts, and human responses identified in each case.

Table 1. Patterns of AI-Supported Decision Practices Across the Three Cases

| Case and AI Technology                                                                                | Input, Output, and Decision Context                                                                                                                                                                                                                      | Empirical Evidence and Human Response                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SMP Negeri 1 Muara Tiga: ChatGPT, Google Gemini, and other AI-supported tools identified in the field | Inputs included administrative, educational, and textual information. Outputs included generated text, summaries, and information analysis used for administrative preparation, reviewing student conditions, and formulating managerial considerations. | Principal: "It helps us finish the work faster, but we still check the result first." (Interview with P1, 2025). Teacher: "We look again at whether it fits the students and the situation at school." (Interview with T1, 2025). |
| SMP Negeri 2 Muara Tiga: AI-supported applications identified during the December 2025 fieldwork      | Inputs included school performance, administrative, and textual information. Outputs consisted of summaries, generated information, and analytical suggestions used for performance monitoring and decision preparation.                                 | Principal: "We don't just take the AI answer. We check it first with our own data." (Interview with P2, 2025). Teacher: "Sometimes we have to adjust it because the situation at school is different." (Interview with T2, 2025). |
| SMP Negeri 1 Delima: ChatGPT, Google Gemini, Microsoft Copilot, Canva AI/                             | Inputs included administrative documents, educational materials, and textual information. Outputs included generated documents, summaries,                                                                                                               | Senior teacher: "AI gives us an overview, but we still have to see the students' real conditions." (Interview with T3, 2025). IT                                                                                                  |

| Case and AI Technology                                                              | Input, Output, and Decision Context                                                                                                                                                                                                                              | Empirical Evidence and Human Response                                                                                                                                        |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Magic Write, Google Workspace AI, and Grammarly, where applicable                   | content, language refinement, and analysis used in student support, planning, and educational management.                                                                                                                                                        | administrator: <i>"The teachers use different AI tools depending on what they need to do."</i> (Interview with IT3, 2025).                                                   |
| Cross-case pattern: AI tools varied according to institutional needs and user roles | Across cases, AI processed administrative, educational, and textual information and generated text, summaries, analyses, content, or suggestions. These outputs informed document preparation, performance monitoring, student support, and managerial planning. | Informants generally said: <i>"AI makes the work easier and faster, but we still have to check and adjust the results before using them."</i> (Cross-case interviews, 2025). |

Source: Authors' analysis of interview data across the three participating junior secondary schools.

Table 1 shows a consistent boundary between informational assistance and managerial authority. At SMP Negeri 1 Muara Tiga, AI supported document preparation and consideration of student conditions, but staff rechecked its suitability. At SMP Negeri 2 Muara Tiga, AI-assisted summaries and analytical suggestions were compared with school data and adjusted when they did not match local circumstances. SMP Negeri 1 Delima used the widest range of applications, yet informants similarly described the outputs as preliminary information requiring comparison with students' actual conditions. Across the cases, the speed and convenience provided by AI did not remove the need for professional assessment.

The distinction between technological speed and contextual authority was articulated most clearly by an IT administrator. Although AI accelerated access to information, the informant emphasized that determining its suitability remained dependent on the situated knowledge of school personnel: *"The technology helps us get information faster, but the people working in the school are still the ones who know whether the information is suitable to use or not."* (Interview with IT3, 2025).

This statement demonstrates that the practical value of AI was determined not only by how quickly it produced information but also by whether human actors considered that information appropriate for the school context. Evidence from the interviews, observations, and institutional documents consistently showed that AI outputs underwent human review before entering managerial decisions. AI therefore functioned as decision support, while school personnel retained interpretive authority over the relevance, contextual suitability, and eventual use of its outputs.

This account summarizes the cross-case pattern documented through the three data sources: technological outputs accelerated access to information, whereas decisions about their suitability remained with school personnel. The evidence therefore identifies AI use as decision support, with its managerial relevance determined only after human review.

### **b. Human Mediation of Algorithmic Recommendations in Educational Decision-Making**

Human mediation occurred through related but empirically distinguishable actions: interpreting an output, verifying it against available evidence, contextualizing it through knowledge of the school and students, and deciding whether to accept, supplement, modify, or reject it. These actions did not occur identically in every school. Table 2 shows how personnel in each case handled AI-supported information before allowing it to influence managerial decisions.

*Table 2. Human Mediation of AI-Supported Information Across the Three Cases*

| Case                                                                                                                     | Interview-Based Evidence                                                                                                                                                                                                                                                                                                      | Managerial Response                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| SMP Negeri 1 Muara Tiga: ChatGPT, Google Gemini, and other AI-supported tools                                            | Principal explained that the results from ChatGPT or Gemini were checked against available school data and actual school conditions before being used (Interview with P1, 2025). Senior teacher added that AI information was compared with what they knew about students and classroom situations (Interview with T1, 2025). | AI-supported information was checked against school data and contextual knowledge before being used.                        |
| SMP Negeri 2 Muara Tiga: AI-supported applications                                                                       | Principal explained that AI results were not used immediately when they seemed unsuitable (Interview with P2, 2025). Vice-principal noted that the information was discussed and sometimes supplemented with other information before being used (Interview with VP2, 2025).                                                  | AI outputs were discussed, supplemented, or modified when they did not fully match the school situation.                    |
| SMP Negeri 1 Delima: ChatGPT, Google Gemini, Microsoft Copilot, Canva AI/Magic Write, Google Workspace AI, and Grammarly | Senior teacher explained that AI results could be used when they matched the situation and were supported by available data (Interview with T3, 2025). IT administrator noted that different AI tools were used depending on the task and that their results still needed to be reviewed (Interview with IT3, 2025).          | AI-supported information was selectively used and could be adjusted or rejected when inconsistent with contextual evidence. |

| Case                                                                       | Interview-Based Evidence                                                                                                                                                                                                                                    | Managerial Response                                                                                                                                          |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cross-case pattern: Different AI tools were used according to school needs | Principals, vice-principals, senior teachers, IT administrators, and school committee representatives generally described AI as helpful for speeding up work, while emphasizing that its results still needed to be checked before being used in decisions. | Across the three schools, AI outputs were not used directly as final decisions. They were checked, interpreted, and adjusted according to school conditions. |

*Source: Authors' analysis of field data from the three participating junior secondary schools.*

Verification was evident in all three cases, but subsequent responses differed. SMP Negeri 1 Muara Tiga primarily emphasized comparison with school records, student conditions, and classroom knowledge. SMP Negeri 2 Muara Tiga added discussion and supplementary information when outputs appeared unsuitable, allowing personnel to modify the information before use. SMP Negeri 1 Delima applied selective acceptance: outputs supported by available data and contextual evidence could be used, whereas inconsistent outputs could be adjusted or rejected. The evidence therefore documents different levels of intervention after verification rather than a uniform response to AI-generated information.

Interpretation and contextualization were particularly visible when staff compared generalized AI outputs with situated knowledge. Personnel considered whether generated information represented actual students, classroom circumstances, available institutional data, and current school conditions. Acceptance was consequently conditional rather than automatic. Modification occurred when outputs were incomplete or did not fit the school context, while rejection remained an available response when contextual inconsistencies could not be resolved. These practices demonstrate how professional discretion operated at the point where AI-generated information was translated into a possible managerial action.

### **c. Accountability and Ethical Tensions in AI-Assisted Educational Management**

Accountability was associated with identifiable human responsibility for checking, explaining, and justifying AI-supported decisions. Informants did not transfer final responsibility to the applications they used. Instead, they described accuracy, contextual relevance, fairness to students, and the explainability of the decision basis as matters requiring human judgment. Table 3 presents how these responsibilities and ethical tensions appeared across the three cases.

Table 3. Accountability and Ethical Tensions in AI-Assisted Decision-Making

| Case                                                                                                                     | Interview-Based Evidence                                                                                                                                                                                                                                                                                                                                        | Human Accountability Response                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SMP Negeri 1 Muara Tiga: ChatGPT, Google Gemini, and other AI-supported tools                                            | Principal explained that AI only helps provide information and that responsibility remains with the person making the decision (Interview with P1, 2025). Vice-principal added that AI results are checked before being used (Interview with VP1, 2025).                                                                                                        | Decision-makers remained responsible for checking, explaining, and justifying decisions supported by AI.                                                                  |
| SMP Negeri 2 Muara Tiga: AI-supported applications                                                                       | Principal explained that uncertain AI results were not immediately used (Interview with P2, 2025). Vice-principal said that they discussed the results and looked for additional information when needed (Interview with VP2, 2025). IT administrator explained that AI results could depend on the information and tool being used (Interview with IT2, 2025). | AI outputs were discussed, checked, and supplemented with other information before being used in decisions.                                                               |
| SMP Negeri 1 Delima: ChatGPT, Google Gemini, Microsoft Copilot, Canva AI/Magic Write, Google Workspace AI, and Grammarly | Senior teacher explained that students with similar data could still have different conditions (Interview with T3, 2025). Principal emphasized that the situation behind the data also needed to be considered (Interview with P3, 2025).                                                                                                                       | AI-supported information was considered together with direct knowledge of students, school conditions, and additional evidence.                                           |
| Cross-case pattern: AI tools used according to school needs                                                              | Principals, vice-principals, senior teachers, IT administrators, and school committee representatives generally explained that AI makes work easier, but its results still need to be checked before being used.                                                                                                                                                | Across the three schools, AI was treated as supporting information. Human actors remained responsible for verification, contextual consideration, and the final decision. |

*Source: Authors' analysis of field data from the three participating junior secondary schools, informed by observations, interviews, and relevant institutional documents.*

At SMP Negeri 1 Muara Tiga, accountability centered on the decision-maker's obligation to verify and explain the use of AI-supported information. At SMP Negeri 2 Muara Tiga, uncertainty triggered discussion and searches for supplementary information rather than immediate use. At SMP Negeri 1 Delima, personnel emphasized that students displaying similar data could still experience different circumstances; consequently, the conditions behind the data were considered before deciding. This finding makes

fairness a contextual issue: treating similar data identically could be inappropriate when the students' actual circumstances differed.

The cross-case comparison revealed three patterns of human response. First, verification was common to all schools and constituted the minimum condition before use. Second, supplementation and modification were most explicit at SMP Negeri 2 Muara Tiga when generated information did not fit institutional circumstances. Third, selective acceptance, adjustment, and possible rejection were most clearly articulated at SMP Negeri 1 Delima, where several AI applications served different tasks. SMP Negeri 1 Muara Tiga provided the clearest evidence of verification, although the available data did not document an equally explicit instance of rejection.

Overall, the findings show that AI-generated information acquired managerial relevance through human mediation rather than direct implementation. Interpretation established what an output meant for the decision at hand; verification tested it against institutional evidence; contextualization related it to students and school conditions; and managerial intervention determined whether it would be accepted, supplemented, modified, or rejected. Across the three schools, final authority and responsibility remained with human actors, although the form and intensity of mediation varied with the task, technology, available data, and institutional context.

## **2. Discussion**

The findings reveal that the decisive issue in AI-supported educational management was not whether humans remained formally present, but how they exercised authority over algorithmic information. Across the three schools, AI outputs acquired managerial relevance only after being compared with institutional records, interpreted through professional knowledge, and assessed against students' actual circumstances. Human authority was therefore enacted through judgment rather than secured by position alone. This matters because decision-support systems can influence priorities and choices without making autonomous decisions: their power emerges when their outputs are accepted as credible, relevant, and actionable. The evidence indicates that school personnel retained control over precisely these determinations.

This finding moves the discussion beyond technology adoption. Studies of AI adoption explain how perceived usefulness, facilitating conditions, infrastructure, motivation, and organizational readiness influence whether educational actors use AI (Hamzah et al., 2026; Saini et al., 2025; Wang et al., 2023). Such factors help explain differences in the range

of applications used across the three schools, but adoption does not explain how an output becomes authoritative in a managerial decision. Even where AI was considered useful, its recommendations were not automatically treated as institutionally valid. The Pidie cases therefore distinguish willingness to use AI from willingness to defer to it, showing that technological acceptance and managerial authorization are analytically different processes.

Sociotechnical Systems Theory clarifies why AI outputs did not carry fixed meanings into these decisions (Happ, 1993; Kelly, 1978). What an output meant depended on its interaction with school records, professional experience, organizational roles, infrastructure, and knowledge of students. This accords with research showing that algorithmic influence is produced through relations among technologies and organizational practices rather than by technical capacity alone (Constantiou et al., 2023; Jarrahi et al., 2021; Ray, 2019; Wendt & Manhart, 2022). The cases extend this position by showing how generalized outputs were converted into—or prevented from becoming—contextually usable information. The relevant unit of analysis is thus the sociotechnical process of authorization, not the algorithmic output in isolation.

Within that process, interpretation and verification performed different but mutually reinforcing functions. Interpretation connected an output to the managerial problem under consideration, while verification tested its consistency with institutional evidence. Their combination prevented fluency or speed from being mistaken for accuracy. AI could generate summaries, classifications, or suggestions, but it could not determine whether the available information adequately represented a student, classroom, or school condition. By treating outputs as provisional claims, school personnel preserved control over the evidentiary threshold for action. This form of evaluative judgment corresponds with accounts of responsible AI literacy that emphasize conceptual understanding, critical verification, and ethical engagement rather than operational proficiency alone (Syamsudduha et al., 2026; Walter, 2024).

Verification, however, was insufficient when the underlying problem concerned representation rather than factual consistency. The finding that students with similar data could face different circumstances demonstrates why technically plausible outputs may remain educationally inappropriate. Contextualization brought situated knowledge into the decision process, while supplementation, modification, selective acceptance, and rejection translated that knowledge into managerial intervention. Professional discretion

was therefore visible in the capacity to alter the influence of an output, not simply to comment on it. This supports the sociotechnical argument that meaningful control depends on whether human actors can reshape technological influence within organizational arrangements (Kudina & van de Poel, 2024).

The relationship among these practices distinguishes meaningful oversight from nominal human involvement. A person may remain “in the loop” yet merely confirm an apparently efficient or objective recommendation. Meaningful control requires the practical capacity to question, supplement, modify, delay, or refuse algorithmic information (de Sio & van den Hoven, 2018; Kanzola et al., 2024; Mecacci & Santoni de Sio, 2020). In the three cases, that capacity was exercised through ordinary managerial work: consulting records, discussing discrepancies, applying contextual knowledge, and retaining authority over use. The authors consequently contend that human oversight should be evaluated by observable acts of mediation rather than by the formal presence of a human decision-maker.

This argument brings Human-Centered AI and Sociotechnical Systems Theory into a more productive relationship. Human-Centered AI establishes why agency, dignity, accountability, and human control must be preserved, whereas the sociotechnical perspective explains how those commitments become embedded—or fail to become embedded—in data practices, routines, roles, and institutional constraints (Aslam et al., 2024; Holzinger et al., 2024). The findings connect the normative and organizational levels by locating agency in concrete managerial practices. They also qualify humanistic models that position AI as a supporting instrument: keeping human values at the center requires arrangements that enable scrutiny and intervention, not merely statements that humans remain responsible (Shofiyah & Muhtarom, 2026).

Accountability accordingly emerged as a capacity to reconstruct and justify how AI-supported information influenced a decision. Assigning final responsibility to school personnel would be largely symbolic if they could not explain what was verified, which contextual differences mattered, or why an output was accepted or changed. Transparency should therefore encompass the reasoning linking an output to a decision, rather than simply disclose the application used. This interpretation reinforces work identifying fairness, transparency, accountability, and human agency as interconnected requirements of educational AI governance (Abrar et al., 2025; Castro et al., 2024; Walter, 2024). It also reframes fairness: comparable data should not compel identical treatment when those data conceal materially different student circumstances.

The results do not demonstrate automation bias as an observed outcome. No documented episode showed personnel following an output after recognizing it as inaccurate or contextually unsuitable. Automation bias remains relevant because apparent computational objectivity can encourage excessive reliance (Abdelwanis et al., 2024; Korteling et al., 2021; Wolf, 2025; Alfredo et al., 2024), but presenting it as a finding would exceed the evidence. A more defensible interpretation is that verification, discussion, and contextual intervention functioned as safeguards against uncritical acceptance (Mouta et al., 2025; Chaaban et al., 2025). The data cannot establish whether these safeguards operated consistently outside the reported and observed situations.

Human-mediated algorithmic management captures the process revealed by these findings more precisely than a generic appeal to human oversight (Chen, 2026; Mouta et al., 2025). Its conceptual contribution lies in explaining how algorithmic information acquires, changes, or loses influence through interpretation, verification, contextualization, and intervention (Alfredo et al., 2024; Chaaban et al., 2025). These are analytically distinguishable mechanisms, but the evidence does not support treating them as a fixed sequence. Verification may require reinterpretation, contextualization may reveal missing evidence, and intervention may reopen earlier judgments. Human mediation is therefore recursive and contingent, varying with the task, data, technology, organizational setting, and authority of the actors involved (Mouta et al., 2025; Zhai, 2025).

This process account also clarifies the institutional implications of risk-proportionate oversight (Nguyen, 2025; Tavorzhanskyi et al., 2025). The study did not classify decisions by risk or compare oversight intensity systematically; consequently, it cannot claim that higher-risk decisions actually received stronger review. It does show why a uniform human sign-off is inadequate (Wolf, 2025; Mouta et al., 2025). Schools need procedures that identify an output's purpose, record the evidence used for verification, document contextual considerations, and explain acceptance, supplementation, modification, or rejection (Alfredo et al., 2024; Tavorzhanskyi et al., 2025). More consequential decisions would reasonably require broader deliberation and stronger documentation, but this remains an implication rather than an established empirical model (Apak & Taygun, 2025; Nguyen, 2025; Wolf, 2025). Responsible digital management thus depends on planning, monitoring, evaluation, and institutional adaptation, not adoption alone (Muin et al., 2026; Ulfah et al., 2026; Zhai, 2025; Chaaban et al., 2025).

Differences in infrastructure and organizational conditions across the Pidie schools did not eliminate human mediation, but they shaped the resources available for carrying it out. This local variation illuminates a wider educational problem: AI adoption can advance faster than governance, reliable data, professional preparation, and institutional capacity (Walter, 2024; Zhai, 2025). UNESCO (2026) similarly links generative AI use to human agency, ethical validation, and institutional responsibility, while research in resource-variable settings shows that infrastructure and organizational support remain integral to responsible digital transformation (Keumalasari et al., 2024; Muin et al., 2026).

Beyond the Aceh context, these findings are relevant to educational systems confronting uneven digital infrastructure, disparities in professional AI literacy, and limited institutional capacity for algorithmic oversight (Mouta et al., 2025; Syamsudduha et al., 2026). Rather than assuming that responsible AI governance depends primarily on technological sophistication, the study highlights the importance of preserving institutional authority to interpret, verify, contextualize, and intervene in algorithmic recommendations (Kudina & van de Poel, 2024; de Sio & van den Hoven, 2018). These mechanisms offer a conceptual basis for examining how human authority over algorithmic information operates across educational settings with different institutional capacities and governance arrangements (Alfredo et al., 2024). Their relevance extends to comparative investigations of the organizational conditions enabling meaningful human oversight, although their operation may vary across cultural, institutional, and regulatory contexts (Chen, 2026). The significance of the Aceh cases, therefore, lies not in representing educational systems elsewhere or offering universally replicable practices, but in illuminating how responsible AI-supported decision-making emerges through professional judgment, institutional evidence, collective deliberation, and the authority to question or modify algorithmic recommendations (Jarrahi et al., 2021; de Sio & van den Hoven, 2018).

Those relationships contribute to broader debates on algorithmic governance because they show that human control is simultaneously individual and institutional. Professional knowledge enabled personnel to recognize contextual inadequacy, but recognition alone would be ineffective without opportunities to discuss discrepancies and authority to alter or reject outputs (Kudina & van de Poel, 2024). Existing routines such as record checking and collegial deliberation can support oversight, yet informal practices may vary among actors and weaken under workload, data limitations, or increasing technological complexity (Jarrahi et al., 2021; Syamsudduha et al., 2026). Sustainable human control therefore requires both critical AI literacy and organizational arrangements that provide documentation, data access, procedural clarity, and accountable responsibility.

The study is limited to 14 adult institutional actors from three purposively selected public junior secondary schools in one regency, restricting statistical generalization beyond these contexts. Students' perspectives and systematic differences among AI applications were not examined. Data were collected during one fieldwork period and relied partly on participant accounts, although triangulated through observations and institutional documents. Complete decision processes and variations in oversight by decision risk were also not documented. Consequently, the four mechanisms represent context-dependent cross-case patterns rather than a fixed causal sequence or universally applicable governance model.

## **D. Conclusion**

This study demonstrates that AI-supported information functioned as decision support rather than as a substitute for managerial authority across the three junior secondary schools. Its influence depended on how school personnel interpreted outputs, verified them against institutional evidence, contextualized them through knowledge of students and school conditions, and intervened by accepting, supplementing, modifying, or rejecting them. Human responsibility was therefore preserved through active judgment, not merely through the formal presence of a person in the decision process. These findings answer the study's objective by showing how educational managers-maintained agency, professional responsibility, contextual discretion, and ethical judgment while using AI-generated information.

The study contributes to the concept of human-mediated algorithmic management as a process-oriented refinement of human-in-the-loop governance. Rather than treating oversight as a final human approval, the concept identifies the recursive managerial practices through which algorithmic information acquires, changes, or loses decision influence. Practically, schools should establish procedures that clarify the purpose of AI use, require verification against institutional evidence, record relevant contextual considerations, and document why outputs are accepted, supplemented, modified, or rejected. Such arrangements preserve professional authority while enabling AI to provide informational and analytical assistance.

Future research should address the limitations of this study by examining more varied schools, regions, and educational systems; incorporating students' perspectives; and comparing how specific AI applications shape human mediation. Longitudinal studies that reconstruct complete decision episodes could trace AI input, verification, deliberation, and final action over time. Research should also classify decisions by risk and compare

whether oversight intensity, documentation, and actor involvement change across low- and high-consequence situations. Multi-site or mixed-method designs could further test the transferability and relative prevalence of the four mechanisms without treating them as a fixed sequence. Finally, AI becomes educationally responsible only when humans retain the authority and capacity to question, contextualize, and change its influence.

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## Declaration of Competing Interest

The authors declare that they have no competing interests that could have influenced the research, analysis, interpretation of findings, or preparation of this manuscript.

## Declaration of Generative AI

During the preparation of this manuscript, the authors used generative artificial intelligence tools solely for language refinement, grammar checking, and improving the clarity and readability of the manuscript. Generative AI was not used to generate, analyze, or interpret the research data, nor to produce the study's findings or conclusions. The authors remain fully responsible for the accuracy, originality, integrity, and final content of the manuscript.

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