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| RESEARCH ARTICLE

Ethical Governance Framework for AI Deployment in Education and Public Administration: An Empirical Documentary Analysis

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| ABSTRACT
Artificial intelligence (AI) is being deployed rapidly in schools, universities and government agencies, yet it remains unclear whether existing governance instruments convert ethical principles into enforceable mechanisms. This empirical study used a structured documentary content analysis of 12 governance instruments issued between 2019 and 2025: four education-specific, four oriented towards public administration and four cross-sector. Each instrument was coded against ten ethical governance dimensions derived from the literature, using a three-point scale (0 = absent, 1 = principle stated, 2 = mechanism specified). Instruments scored a mean of 13.3 out of 20 (SD = 2.96); 39.2% of coded cells specified a mechanism and 5.8% were absent. Human oversight (M = 1.50) was the best-covered dimension, whereas inclusion, equity and access (M = 1.17) was the weakest. Education-specific instruments scored lowest on accountability and on monitoring and enforcement (both M = 0.75), while public-administration instruments scored lowest on inclusion (M = 0.75). Total scores did not differ significantly across instrument types, H (2) = 1.49, p =.476, but coverage of risk management and of monitoring were positively associated, ρ =.62, p =.032. Building on these gaps, the paper proposes a five-layer Ethical Governance Framework for AI Deployment in Education and Public Administration (EGF-AIEPA) and sets out implications for policymakers in Nigeria and comparable contexts. Findings are exploratory because of the small purposive sample and single-coder design.

| KEYWORDS

Artificial intelligence, AI ethics, governance framework, education policy, public administration, accountability, Nigeria.

| ARTICLE INFORMATION

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1. Introduction

AI systems now support admissions decisions, automated marking, learner analytics, benefits allocation and the triage of citizen requests. Reviews of the field show steady growth in educational applications (Chen et al., 2020; Zhai et al., 2021; Zawacki-Richter et al., 2019), and the arrival of generative AI has widened both opportunity and risk for teaching, assessment and academic integrity (Cotton et al., 2024; Kasneci et al., 2023; Tlili et al., 2023). In

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government, AI has been described as a tool that can reshape administrative discretion, service delivery and accountability relationships (Bullock, 2019; Wirtz et al., 2019; Young et al., 2019).

The volume of ethical guidance has grown just as quickly. Global reviews identify recurrent principles such as transparency, fairness, responsibility and privacy (Corrêa et al., 2023; Floridi & Cowls, 2019; Jobin et al., 2019). Yet scholars warn that principles alone do not guarantee ethical practice (Hagendorff, 2020; Mittelstadt, 2019). The practical question for institutions that deploy AI is therefore not whether principles exist, but whether the governing instruments that bind or guide them specify mechanisms such as impact assessment, oversight duties, audit and redress.

This question matters acutely in sub-Saharan Africa. Nigeria published its first National Artificial Intelligence Strategy in September 2025, which proposes an ethics expert group, a national risk management framework and an independent governance body (Federal Ministry of Communications, Innovation and Digital Economy [FMCIDE], 2025). Research on Nigerian education also points to digital inequality, uneven teacher readiness and academic-integrity concerns in technology-enhanced assessment and learning (Asemota et al., 2026; Edinoh et al., 2026). Education and public administration share a distinctive feature: both involve consequential decisions about people who often cannot opt out. This paper therefore asks four research questions.

1.1 Research Questions:

a. RQ1: To what extent do current governance instruments address ten ethical governance dimensions?
b. RQ2: Which dimensions are most and least often operationalised as mechanisms rather than stated as principles?
c. RQ3: Do education-specific, public-administration and cross-sector instruments differ in coverage?
d. RQ4: What governance framework follows from the observed gaps?

2. Literature Review and Conceptual Basis

2.1 From principles to practise

Jobin et al. (2019) mapped 84 AI ethics documents and found convergence around five principles, while Floridi and Cowls (2019) proposed five principles for AI in society: beneficence, non-maleficence, autonomy, justice and explicability. Corrêa et al. (2023) analysed 200 guidelines and identified 17 recurring principles. Despite this convergence, Hagendorff (2020) concluded that guidelines are rarely enforced, and Mittelstadt (2019) argued that AI lacks the professional norms, tested methods and legal accountability that give principles force in fields such as medicine. Taeihagh (2021) describes the governance challenge as one of choosing between soft and hard regulatory tools under uncertainty, and Mökander et al. (2021) examine ethics-based auditing as a procedural bridge between principles and verifiable conduct. Papagiannidis et al. (2025) synthesise responsible AI governance into structural, relational and procedural practices. These strands support treating governance as a set of mechanisms and not only a set of values.

2.2 Ethics of AI in Education

An early systematic review found that research on AI in higher education rarely engaged with ethical implications or with educators (Zawacki-Richter et al., 2019). Later work has responded. Holmes et al. (2022) argue that the ethics of AI in education is more complex than general AI ethics because of the power relations of schooling, and Akgun and Greenhow (2022) identify privacy, surveillance, autonomy, bias and discrimination as central K-12 concerns. Nguyen et al. (2023) synthesise ethical principles for AI in education, including transparency, accountability, privacy and inclusiveness. Holmes and Tuomi (2022) and Williamson and Eynon (2020) caution that commercial and political interests shape what is built and adopted. Schiff (2022) shows that national AI strategies emphasise education for AI, meaning skills for the AI workforce, more than the governance of AI in education. A recent meta-review likewise calls for increased ethics, collaboration and rigour in AI in higher education research (Bond et al., 2024).

2.3 AI Governance in Public Administration

Wirtz et al. (2019) catalogue public-sector AI applications and challenges, and Wirtz et al. (2020) propose an integrated governance framework that links law, ethics and societal risks. Young et al. (2019) conceptualise 'artificial discretion', and Bullock (2019) argues that AI suits tasks of low uncertainty and complexity, which implies that governance should vary with task type. Busuioc (2021) shows how algorithmic opacity strains public accountability, and Zuiderwijk et al. (2021) find that the literature on AI in public governance needs a stronger research agenda on ethics and regulation. Regulatory design is also contested: Smuha (2021) analyses regulatory competition, and Veale and Zuiderveen Borgesius (2021) critique the risk-based architecture of the EU AI Act.

2.4 African Perspectives

Birhane (2021) advances a relational ethic of algorithmic injustice that foregrounds those most affected, and Eke et al. (2023) bring together African perspectives on responsible AI. In Nigeria, evidence from digital assessment and technology-enhanced learning highlights infrastructural inequality and integrity risks that governance instruments would need to anticipate (Asemota et al., 2026; Edinoh et al., 2026).

2.5 Analytical dimensions

Synthesising these strands, ten dimensions were adopted (Table 1): transparency and explainability (D1); fairness and non-discrimination (D2); accountability and liability (D3); privacy and data protection (D4); human oversight (D5); safety, robustness and risk management (D6); inclusion, equity and access (D7); AI literacy and capacity building (D8); stakeholder participation (D9); and monitoring, auditing and enforcement (D10).

Table 1
Ethical Governance Dimensions and Coding Anchors

Code	Dimension	Score 1 (principle stated)	Score 2 (mechanism specified)
D1	Transparency and explainability	Transparency or explainability endorsed	Duty to notify, explain or document decisions
D2	Fairness and non-discrimination	Fairness or non-bias endorsed	Bias testing or impact assessment required
D3	Accountability and liability	Responsibility stated generally	Named duty-holder, liability or traceability rule
D4	Privacy and data protection	Privacy endorsed	Specific data rule (for example, consent, age limit, data governance)
D5	Human oversight	Human-centred or 'human control' language	Required human intervention or review point
D6	Safety and risk management	Safety or robustness endorsed	Risk assessment or risk-management process specified
D7	Inclusion, equity and access	Inclusion or equity endorsed	Concrete measure (for example, access programme, accessibility duty)
D8	AI literacy and capacity	Skills or literacy endorsed	Training obligation or programme specified
D9	Stakeholder participation	Consultation or collaboration endorsed	Named body, process or co-design requirement
D10	Monitoring and enforcement	Review or monitoring mentioned	Audit, conformity assessment, sanction or regulator named

Note. A score of 0 was assigned when the dimension was not addressed. The full protocol is in Appendix A.

3. Method

3.1 Design

The study used a quantitative documentary content analysis. The unit of analysis was the governance instrument, and the coding unit was the dimension within each instrument, yielding 120 coded cells (12 instruments × 10 dimensions).

3.2 Sample

Instruments were purposively selected against four criteria: (a) issued by an international organisation, government, regional body or standards body; (b) published between 2019 and 2025; (c) focused on AI governance in education, public administration or across sectors; and (d) publicly available in English. Twelve instruments met these criteria and were divided equally across three types, as shown in Table 2. The instruments are UNESCO (2019, 2021, 2023), the U.S. Department of Education (2023), the Department for Education (2023), the Treasury Board of Canada Secretariat (2019), the Personal Data Protection Commission and Infocomm Media Development Authority (PDPC & IMDA, 2020), FMCIDE (2025), the African Union (2024), the OECD (2019), the European Union (2024) and the National Institute of Standards and Technology (NIST, 2023).

Table 2
Governance Instruments Analysed (N = 12)

Instrument	Issuer	Year	Type	Legal status
Beijing Consensus on AI and Education	UNESCO	2019	Education-specific	Non-binding
Guidance for Generative AI in Education and Research	UNESCO	2023	Education-specific	Non-binding
AI and the Future of Teaching and Learning	US Department of Education	2023	Education-specific	Policy report
Generative AI in Education	UK Department for Education	2023	Education-specific	Guidance
Directive on Automated Decision-Making	Treasury Board of Canada Secretariat	2019	Public administration	Binding on federal institutions
Model AI Governance Framework (2nd ed.)	PDPC and IMDA, Singapore	2020	Public administration	Voluntary
National AI Strategy	Federal Government of Nigeria	2025	Public administration	National strategy
Continental AI Strategy	African Union	2024	Public administration	Regional strategy
Recommendation on the Ethics of AI	UNESCO	2021	Cross-sector	Non-binding
Recommendation on AI (amended 2024)	OECD	2019	Cross-sector	Non-binding
Regulation (EU) 2024/1689 (AI Act)	European Union	2024	Cross-sector	Binding
AI Risk Management Framework 1.0	NIST	2023	Cross-sector	Voluntary

Note. 'Public administration' denotes instruments written primarily for government use of AI or national AI governance.

3.3 Procedure and Analysis

Each instrument was read against the protocol in Table 1 and scored 0, 1 or 2 on each dimension, giving a total between 0 and 20. Coding applied a single rule: a score of 2 required an identifiable mechanism, procedure, obligation or named institutions, even where the institution was still to be established. Analysis comprised descriptive statistics (frequencies, means and standard deviations), a Kruskal – Wallis test of total scores across the

three instrument types, and a Spearman rank correlation between D6 and D10. Because the sample is small, inferential tests are exploratory, no correction for multiple comparisons was applied, and the significance level was set at.05. Charts were produced from the coded matrix.

3.4 Reliability and Ethics

A single coder applied the protocol; inter-rater reliability was not computed, and this is acknowledged as a limitation. The study analysed public documents only and involved no human participants, so formal ethical clearance was not required.

4. Results

4.1 Overall coverage (RQ1)

The 12 instruments scored a mean total of 13.3 out of 20 (SD = 2.96; range 9–20), equivalent to 66.7% of the maximum. Across all 120 cells, 7 (5.8%) were scored 0, 66 (55.0%) were scored 1 and 47 (39.2%) were scored 2. Thus, almost every instrument acknowledged almost every dimension, but fewer than two in five cells moved beyond principle to mechanism. Table 3 gives the full coded matrix.

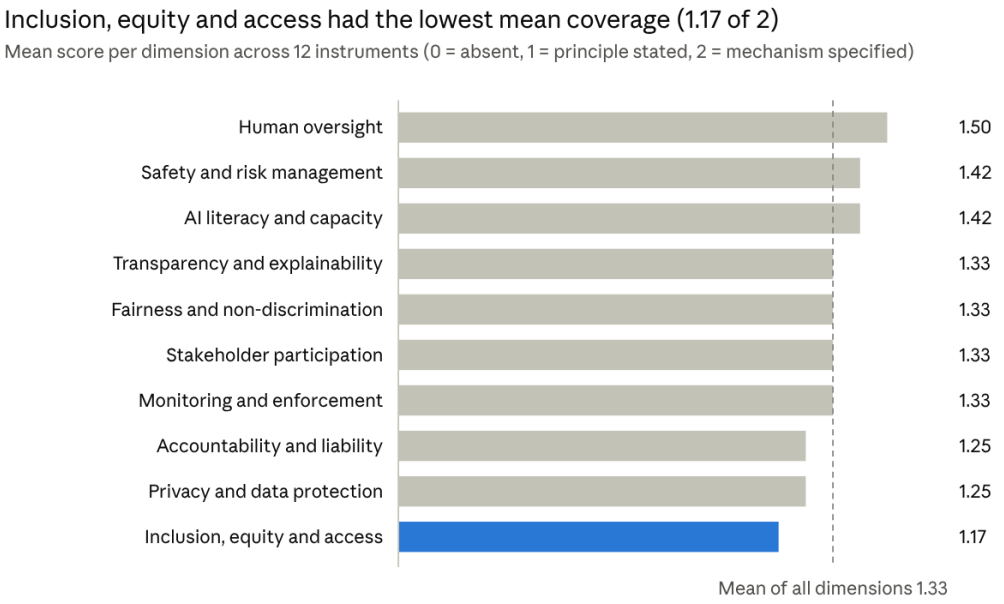
Table 3
Coded Matrix of Governance Instruments by Dimension

Instrument	Type	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Total
Beijing Consensus (2019)	E	1	1	0	1	1	0	2	2	1	0	9
UNESCO GenAI Guidance (2023)	E	1	1	1	2	2	1	2	2	2	1	15
US Dept of Education (2023)	E	1	2	1	1	2	1	1	1	2	1	13
UK DfE (2023)	E	1	1	1	2	1	2	1	1	0	1	11
Canada ADM Directive (2019)	P	2	2	2	1	2	1	0	0	1	2	13
Singapore Framework (2020)	P	2	1	1	1	2	1	0	1	1	1	11
Nigeria NAIS (2025)	P	1	1	1	1	1	2	1	2	2	2	14
AU Continental Strategy (2024)	P	1	1	1	1	1	1	2	2	2	1	13
UNESCO Recommendation	G	2	2	2	2	2	2	2	2	2	2	20

Instrument	Type	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Total
(2021)												
OECD Principles (2019/2024)	G	1	1	1	1	1	2	1	1	1	1	11
EU AI Act (2024)	G	2	2	2	1	2	2	1	2	1	2	17
NIST AI RMF (2023)	G	1	1	2	1	1	2	1	1	1	2	13

Note. E = education-specific; P = public administration; G = cross-sector. 0 = absent; 1 = principle stated; 2 = mechanism specified. D1 – D10 are defined in Table 1.

Figure 1
Mean Coverage Score for Each Governance Dimension



Coded matrix in Table 3; counts in Table 4 (12 instruments, 10 dimensions)

Note. Dimensions are ordered by mean score, computed from the counts in Table 4. The dashed line marks the mean across all ten dimensions.

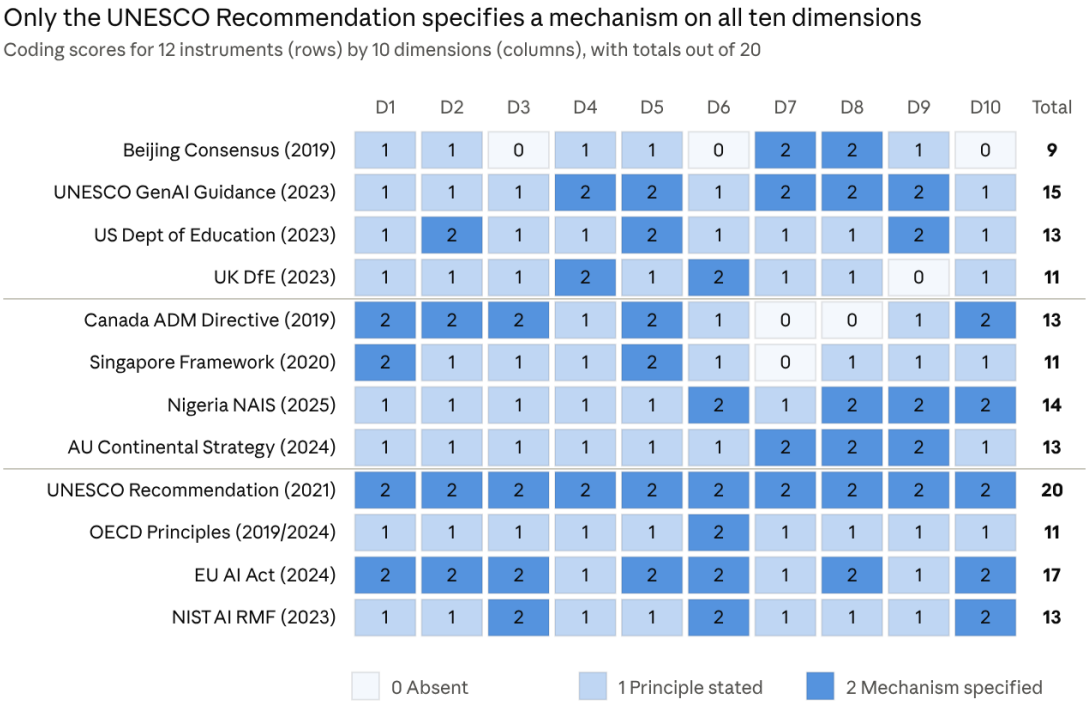
4.2 Dimension-Level Results (RQ2)

Table 4 shows that human oversight (D5) had the highest mean (M = 1.50) and, together with risk management (D6) and AI literacy (D8), the largest number of instruments specifying a mechanism (six of 12). Inclusion, equity and access (D7) had the lowest mean (M = 1.17) and was the only dimension absent from two instruments. Privacy and data protection (D4) was addressed by every instrument, yet only three of 12 specified a concrete data rule, the fewest of any dimension. This pattern suggests that privacy is widely endorsed but rarely translated into instrument-specific provisions, often because the instrument defers to separate data-protection law, as is the case with the reliance of Nigeria's strategy on the Nigeria Data Protection Act 2023 (Federal Republic of Nigeria, 2023).

Table 4
Coverage of Each Dimension Across the 12 Instruments
Note. Counts are a number of instruments (N = 12). Maximum score per dimension = 2.

Dimension	Absent (0)	Principle (1)	Mechanism (2)	M	SD
D1 Transparency and explainability	0	8	4	1.33	0.49
D2 Fairness and non-discrimination	0	8	4	1.33	0.49
D3 Accountability and liability	1	7	4	1.25	0.62
D4 Privacy and data protection	0	9	3	1.25	0.45
D5 Human oversight	0	6	6	1.50	0.52
D6 Safety and risk management	1	5	6	1.42	0.67
D7 Inclusion, equity and access	2	6	4	1.17	0.72
D8 AI literacy and capacity	1	5	6	1.42	0.67
D9 Stakeholder participation	1	6	5	1.33	0.65
D10 Monitoring and enforcement	1	6	5	1.33	0.65
All cells (n = 120)	7	66	47	1.33	0.65

Figure 2
Heat Map of Coding Scores by Instrument and Dimension



Coded matrix in Table 3 (12 instruments, 10 dimensions)

Note. Rows are grouped by instrument types: education-specific, public administration and cross-sector, in that order. Darker cells indicate that a mechanism is specified.

4.3 Differences by Instrument Types (RQ3)

Mean totals were 12.00 (SD = 2.58) for education-specific, 12.75 (SD = 1.26) for public-administration and 15.25 (SD = 4.03) for cross-sector instruments (Figure 3). The Kruskal – Wallis test showed no statistically significant difference, H (2) = 1.49, p =.476, so the descriptive gap should not be over-interpreted given n = 4 per group. The profile by

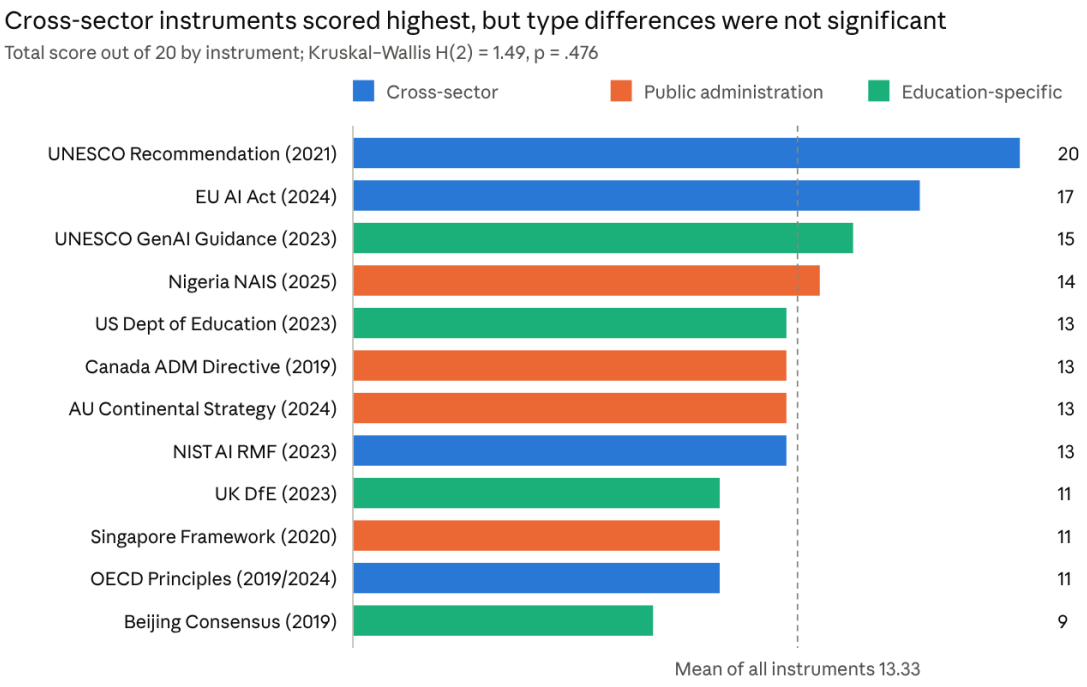
dimensions was, however, more informative (Table 5). Education-specific instruments averaged only 0.75 on accountability (D3) and on monitoring and enforcement (D10), against 1.75 on both D3 and D10 for cross-sector instruments. Public-administration instruments averaged just 0.75 on inclusion (D7), because the Canadian and Singaporean instruments did not address it. Cross-sector instruments reached the ceiling of 2.00 on risk management (D6). By legal status, the two binding instruments (the EU AI Act and the Canadian Directive) averaged 15.0 against 13.0 for the ten non-binding instruments, a descriptive difference only.

Table 5
Mean Dimension Scores by Instrument Type

Dimension	Education-specific (n = 4)	Public administration (n = 4)	Cross-sector (n = 4)
D1 Transparency	1.00	1.50	1.50
D2 Fairness	1.25	1.25	1.50
D3 Accountability	0.75	1.25	1.75
D4 Privacy	1.50	1.00	1.25
D5 Human oversight	1.50	1.50	1.50
D6 Safety and risk	1.00	1.25	2.00
D7 Inclusion	1.50	0.75	1.25
D8 AI literacy	1.50	1.25	1.50
D9 Participation	1.25	1.50	1.25
D10 Monitoring	0.75	1.50	1.75
Total (Max 20)	12.00	12.75	15.25

Note. Kruskal – Wallis H (2) = 1.49, p =.476.

Figure 3
Total Governance Score by Instrument and Instrument Type



Coded matrix in Table 3 (12 instruments); totals computed from the ten dimension scores.
Note. Instruments are ordered by total score. The dashed line marks the mean total.

Finally, a Spearman correlation showed a positive association between coverage of safety and risk management (D6) and of monitoring and enforcement (D10), ρ =.62, p =.032. Instruments that specify how risk is managed also tended to specify how compliance is verified, which indicates that risk processes and audit mechanisms are typically designed together. This finding is exploratory and rests on 12 observations with tied ranks.

5. Discussion

5.1 Principles outnumber mechanisms (RQ1 and RQ2)

The 12 instruments covered nearly every dimension, but 55.0% of coded cells remained at the level of principle and only 39.2% specified a mechanism. This pattern matches earlier warnings that AI ethics guidance is seldom enforced (Hagendorff, 2020) and that principles alone cannot guarantee ethical conduct (Mittelstadt, 2019). It also fits the finding of Corrêa et al. (2023) that very few of 200 guidelines offered practical methods of implementation. The present study adds that the shortfall is uneven. Human oversight, risk management and AI literacy were the most operationalised dimensions, whereas privacy was acknowledged by every instrument yet specified by only three, usually because the instrument defers to separate data-protection law. Inclusion, equity and access was the weakest dimension overall, which is consistent with arguments that justice-oriented considerations are the hardest to translate into procedures (Birhane, 2021).

5.2 Accountability and Enforcement Gaps in Education (RQ3)

Education-specific instruments averaged 0.75 on accountability and on monitoring and enforcement, the lowest values in Table 5. These instruments tend to be guidance for teachers, institutions and developers, not regulatory texts, and they therefore state expectations without assigning liability or audit duties. Yet education is a setting in which learners have little power to refuse automated decisions, and Holmes et al. (2022) argue that this power asymmetry makes the ethics of AI in education distinctive. Williamson and Eynon (2020) and Holmes and Tuomi (2022) further note that commercial interests shape which systems reach classrooms, which strengthens the case for explicit vendor accountability. Schiff (2022) observed that national strategies privilege education for AI over the governance of AI in education, and the low enforcement scores found here are consistent with that imbalance.

5.3 Inclusion Gaps in Public Administration (RQ3)

Public-administration instruments averaged 0.75 on inclusion, because the Canadian Directive and the Singaporean framework did not address it. Both instruments were designed mainly for automated decision systems in high-capacity administrations. Contexts with uneven electricity, connectivity and teacher readiness need explicit access and capacity provisions, and the African Union strategy and the Nigerian strategy, which scored 2 and 1 on inclusion and 2 on AI literacy, reflect that need (African Union, 2024; FMCIDE, 2025). Empirical work on Nigerian assessment and learning reaches a similar conclusion: digital inequality and integrity risks shape how technology can be used fairly (Asemota et al., 2026; Edinoh et al., 2026). African scholarship on responsible AI likewise stresses locally grounded governance (Eke et al., 2023).

5.4 Risk Management and Monitoring Travel Together

The positive association between risk management and monitoring, ρ =.62, suggests that instruments that require risk assessment also tend to define how compliance is verified. The EU AI Act illustrates this link through conformity assessment and post-market monitoring, although Veale and Zuiderveen Borgesius (2021) caution that its risk-based design depends on how risk categories are drawn and enforced. Ethics-based auditing offers a procedural complement, but Mökander et al. (2021) show that it has clear limits when used alone. Papagiannidis et al. (2025) similarly emphasise that governance requires structural, relational and procedural practices working together. For Nigeria, the strategy names an ethics expert group, a risk management framework and an independent regulator, so its scores on D6, D9 and D10 reflect planned structures, and their effect will depend on implementation (FMCIDE, 2025).

5.5 Binding Status

The two binding instruments averaged 15.0 against 13.0 for the others, which is a descriptive difference only. Because the sample includes just two binding texts, the study cannot separate the effect of legal status from

instrument purpose. Taeihagh (2021) and Smuha (2021) both describe the choice between hard and soft regulation as strategic and context dependent, so the comparison should be revisited with a larger sample.

5.6 A Proposed Ethical Governance Framework (RQ4)

The observed gaps motivate the Ethical Governance Framework for AI Deployment in Education and Public Administration (EGF-AIEPA). It has five layers, each tied to a dimension that the analysis showed to be thin and each specifying a mechanism, not only a principle (Table 6). The framework is derived from the coded evidence and the literature; it has not yet been tested empirically.

Table 6

The Ethical Governance Framework for AI Deployment in Education and Public Administration (EGF-AIEPA)

Layer	Core mechanisms	Dimensions	Gap addressed	Example indicator
1. Rights-based principles	Statement of rights covering transparency, fairness, privacy and contestability, linked to data-protection law	D1, D2, D4	Privacy endorsed everywhere but specified in only 3 of 12 instruments	Share of AI systems with a documented data-protection basis
2. Accountability architecture	Named accountable officer per institution; register of AI systems; vendor obligations in procurement	D3	Education-specific mean of 0.75 on accountability	Proportion of deployed systems with a named duty-holder
3. Risk-tiered assessment and human oversight	Impact assessment before deployment; stricter tier for admissions, assessment and benefit allocation; mandatory human review points	D5, D6	Risk and oversight were strong but not always paired with verification	Proportion of high-impact systems with completed assessment and review point
4. Capacity, inclusion and access	Teacher and staff AI literacy programmes; access and accessibility duties; low-bandwidth and offline options	D7, D8	Inclusion had the lowest mean (1.17); public-administration mean of 0.75	Training coverage; share of learners or citizens with usable access
5. Participation, monitoring and redress	Multi-stakeholder council including learners and parents; annual independent audit; public reporting; complaints and redress	D9, D10	Education-specific mean of 0.75 on monitoring and enforcement	Audit completion rate; median time to resolve complaints

Note. D1 – D10 are defined in Table 1.

The layers are cumulative. Layer 1 sets the normative base, Layers 2 and 3 convert it into duties and assessments, Layer 4 ensures that the benefits and burdens of AI are distributed fairly, and Layer 5 verifies that the other layers work in practice and gives affected people a route to challenge outcomes.

5.7 Implications and Recommendations

For policymakers in Nigeria and comparable contexts, five actions follow. First, ministries of education and public service bodies should require a documented impact assessment before AI is used in admissions, grading, learner analytics or benefit allocation. Second, every school system and agency should designate an accountable officer and keep a register of AI systems in use, with procurement clauses that bind vendors to transparency and audit access.

Third, AI governance texts should state explicitly how they relate to the Nigeria Data Protection Act 2023, since privacy was widely endorsed but rarely specified. Fourth, access provisions should address electricity, connectivity and offline use, and teacher training should be funded as a governance measure, not only as a skills measure. Fifth, councils that include teachers, learners and parents should review annual audit findings and publish them.

For researchers, the coded matrix offers a replicable baseline against which later instruments, including Nigeria's forthcoming regulatory arrangements, can be compared.

5.8 Limitations and Future Research

Notwithstanding the insights provided by this investigation, two principal limitations should be acknowledged alongside justifications for the continued validity and relevance of the findings:

First, the sample was small, purposive, restricted to English-language documents and comprised governance instruments that varied in length, purpose, and legal force, which limited statistical power during non-parametric testing. Justification: Nevertheless, small and purposive sampling is a standard, highly effective approach in exploratory policy and document analysis. Because the selected instruments represent key foundational texts within the target domain, the identified trends offer strong comparative insights that remain valid and informative for governance research.

Second, the study relied on a single coder applying an unvalidated framework using an equally weighted scale measuring mechanism presence rather than enforcement quality, without computing inter-rater reliability. Justification: However, utilising a single, systematically applied coding protocol ensures strict internal consistency across all evaluated instruments. Furthermore, mapping structural presence establishes an essential empirical baseline regarding policy intent, providing a reliable foundation for future framework validation and implementation research.

Future research should recruit a second coder to report agreement statistics, extend the sample to national education AI policies and sub-national guidance, and validate the framework through a Delphi study with educators, administrators, and regulators. Longitudinal work could test whether instruments with more mechanisms are associated with better compliance and fewer issues.

6. Conclusion

This study analysed 12 governance instruments against ten ethical governance dimensions and found that principles outnumber mechanisms: 39.2% of cells specified a mechanism, and the weakest areas were inclusion, accountability and monitoring in specific instrument types. Education-specific instruments were weakest on accountability and enforcement, and public-administration instruments were weakest on inclusion. The proposed five-layer EGF-AIEPA responds to these gaps by pairing each ethical commitment with a verifiable mechanism. If adopted and tested, it can help education systems and public institutions deploy AI in ways that are accountable, inclusive and open to challenge.

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Appendix A
Coding Protocol

1. **Unit and scale.** Each instrument was scored on each of ten dimensions: 0 = not addressed; 1 = addressed as a principle, aspiration or general expectation; 2 = addressed through an identifiable mechanism, procedure, obligation or named institutions.
2. **Evidence rule.** A score of 2 required a specific provision, not a general reference. Where an institution was to be established (for example, a regulator proposed in a national strategy), the provision was scored 2 because the mechanism was named, and this is noted as a planned structure.
3. **Cross-references.** An instrument that only referred the reader to another law or standard for a dimension was scored 1 for that dimension.
4. **Totals.** Dimension scores were summed to a total from 0 to 20 for each instrument.
5. **Group assignment.** Instruments were assigned to education-specific, public administration or cross-sector types according to their stated primary audience and scope.