

Information Assurance In Ai-Based Educational Supervision: Assessing Security, Privacy, Integrity, And Trust In Omani Government Schools

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Abstract - The integration of artificial intelligence (AI) into educational supervision offers opportunities to improve teacher evaluation, feedback, and professional development. However, the use of AI in supervision raises important information assurance concerns related to security, privacy, data integrity, and trust. This study aims to assess information assurance in AI-based educational supervision within Omani government schools, with particular attention to Information Technology teachers. A mixed-methods approach will be employed, combining a questionnaire and semi-structured interviews to examine teachers' perceptions of AI-related security, privacy, integrity, and trust. The study is expected to identify key information assurance requirements and challenges associated with AI-based educational supervision and to provide recommendations for secure, trustworthy, and responsible implementation. The findings may support educational institutions in developing AI-based supervisory practices that protect sensitive information while maintaining transparency, accountability, and human oversight.

Keywords: Artificial Intelligence, Educational Supervision, Teacher Resistance, AI Acceptance, AI Literacy, Professional Autonomy, Information Technology Teachers, Oman.

I. Introduction

Artificial intelligence (AI) has become an important component of digital transformation in education, creating opportunities to improve teaching, learning, assessment, administration, and educational supervision. Educational institutions are increasingly using AI-based technologies to analyze educational data, support decision-making, provide feedback, and identify areas for professional development. These developments are also transforming educational supervision, which traditionally relies on classroom observations, professional discussions, and supervisors' professional judgments. AI-based educational supervision can provide continuous access to instructional information, support the analysis of teacher performance, generate feedback, and assist supervisors in identifying professional development needs. However, the use of AI in supervision involves the collection, processing, storage, and transmission of potentially sensitive information about teachers, students, and educational activities. This creates important information assurance challenges related to the security, privacy, integrity, availability, and trustworthiness of supervisory data and AI-generated outputs. From another perspective, the Information assurance (IA) is particularly important when AI is used to support educational evaluation and decision-making. Non-authorized access to supervisory information may compromise confidentiality and privacy, while inaccurate, incomplete, or improperly modified data may affect the integrity of AI-generated evaluations. In addition, teachers and supervisors need confidence that AI systems operate transparently, reliably, and responsibly. Concerns about how

data are collected, who can access them, how they are processed, and how AI-generated recommendations are used may affect trust in AI-based supervision [1-4]. Human oversight and accountability are therefore important to ensure that AI supports rather than replaces professional judgment. Also, the Omani education system is undergoing continued digital transformation, increasing the relevance of examining information assurance requirements associated with emerging educational technologies [5]. As AI-based applications become increasingly accessible to educational institutions, there is a need to understand how security, privacy, data integrity, and trust can be maintained within educational supervision. This is particularly relevant in government schools, where supervisory systems may involve sensitive professional and educational information.

II. Literature Review

The daily increase use of artificial intelligence (AI) in education has increased the importance of ensuring that AI-supported systems are secure, trustworthy, and responsible, particularly when they process sensitive educational and professional information. Existing research indicates that teachers' trust in AI is influenced by their understanding of AI, self-efficacy, perceived benefits, and concerns about its use [1], [2]. Choi et al. [1] found that perceived usefulness, ease of use, and trust are important factors in teachers' acceptance of educational AI, while Viberg et al. [2] demonstrated that AI understanding and self-efficacy are associated with greater perceived benefits, fewer concerns,

and higher trust across different cultural contexts. Teacher AI competence also includes knowledge of AI ethics, assessment, and human-centered use, highlighting the importance of responsible and secure AI practices [6]. Similarly, research on technological anxiety suggests that uncertainty and concerns surrounding AI can affect teachers' confidence and engagement with AI technologies [13], [14]. Studies examining AI adoption further emphasize perceived risk, technical support, trust, and usefulness as important considerations in educational AI implementation [3], [7], [10], [11], [15]. These findings suggest that effective AI integration requires more than technological functionality; it also requires mechanisms that protect information, maintain privacy, ensure data and output integrity, and establish user trust. However, much of the existing research has focused on AI adoption in teaching and learning rather than information assurance within AI-based educational supervision, where teacher performance information and potentially sensitive educational data may be collected, processed, and evaluated. Therefore, further research is needed to examine security, privacy, integrity, and trust as central information assurance dimensions of AI-based educational supervision, particularly within the context of Omani government schools.

III. Methodology

3.1 Research Design

This study will employ a mixed-methods research design to investigate the factors influencing teachers' resistance to AI-based educational supervision. A mixed-methods approach is appropriate because the study seeks to identify measurable relationships between potential influencing factors and teacher resistance while also exploring teachers' perceptions and experiences in greater depth [7-10].

The quantitative phase will use a structured questionnaire to examine the relationships between teachers' resistance to AI-based educational supervision and factors including AI literacy, trust in AI, perceived usefulness, technological anxiety, privacy concerns, perceived fairness, professional autonomy, and job-security concerns. The qualitative phase will use semi-structured interviews to provide deeper explanations of teachers' concerns, expectations, and reasons for accepting or resisting AI-based supervision.

The overall research process followed these stages:

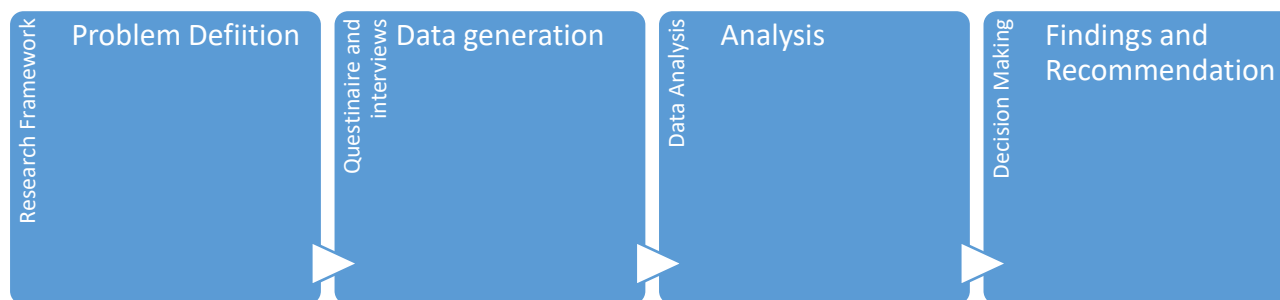


Figure 1: IA and AI-EdTech the Research Methodology Framework

3.2 Research Framework

The proposed framework is based on the assumption that teachers' resistance to AI-based educational supervision is influenced by technological, psychological, professional, and organizational factors.

Independent Variables:

- Information security
- Privacy and confidentiality
- Data integrity

- Trust in AI systems
- Data availability
- Transparency and accountability
- Human oversight
- AI literacy

Dependent Variable:

- Teachers' resistance to AI-based educational supervision.

The conceptual relationship can be represented as:

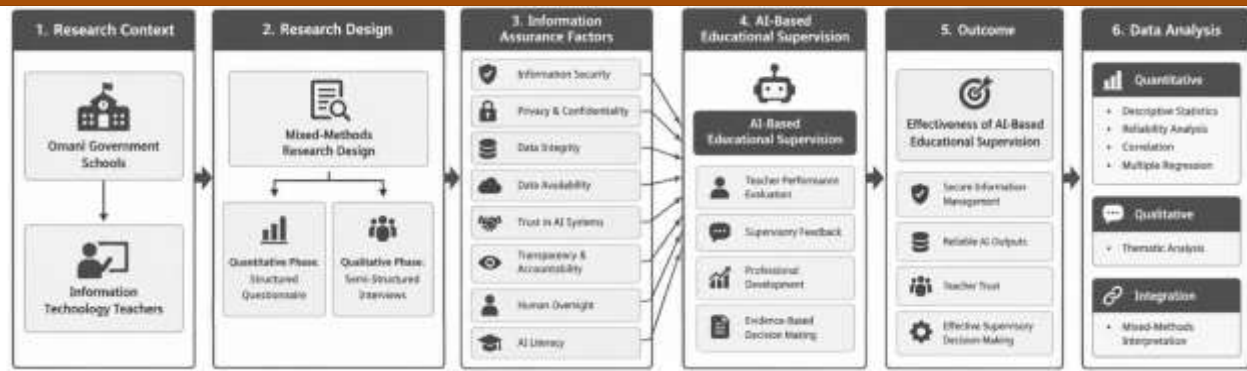


Figure 2: Framework for Information Assurance in AI-Based Educational Supervision

3.3 Population and Sample

The target population will consist of Information Technology teachers working in government schools in Oman. Information Technology teachers are selected because their professional background involves relatively high exposure to digital technologies and therefore provides a relevant population for investigating attitudes toward AI-based educational supervision. A stratified sampling approach will be used, where possible, to ensure representation from

different geographical areas and school contexts. The quantitative sample size will be determined using an appropriate statistical power analysis based on the expected effect size, significance level, and number of predictors [11-13].

For the qualitative phase, a purposive sample of Information Technology teachers will be selected from questionnaire participants who are willing to participate in interviews. Interviews will continue until sufficient thematic depth is achieved [14].

Table 1: Research Instruments and Measurement Framework

Research Instrument	Construct	Measurement Dimensions	Scale	Data Collection Method
Teacher Questionnaire	AI Literacy	AI knowledge, skills, awareness, and ethical understanding	5-point Likert	Self-administered questionnaire
Teacher Questionnaire	Trust in AI	Reliability, accuracy, transparency, and confidence	5-point Likert	Self-administered questionnaire
Teacher Questionnaire	Perceived Usefulness	Efficiency, feedback quality, professional development, and supervisory support	5-point Likert	Self-administered questionnaire
Teacher Questionnaire	Technological Anxiety	Fear, uncertainty, discomfort, and difficulty using AI	5-point Likert	Self-administered questionnaire
Teacher Questionnaire	Privacy Concerns	Data security, confidentiality, monitoring, and data access	5-point Likert	Self-administered questionnaire
Teacher Questionnaire	Perceived Fairness	Objectivity, consistency, transparency, and evaluation accuracy	5-point Likert	Self-administered questionnaire
Teacher Questionnaire	Professional Autonomy	Professional judgment, independence, decision-making, and human control	5-point Likert	Self-administered questionnaire
Teacher Questionnaire	Job-Security Concerns	Job displacement, employment uncertainty, and increased monitoring	5-point Likert	Self-administered questionnaire
Teacher Questionnaire	Resistance to AI-Based Educational Supervision	Reluctance, opposition, avoidance, and unwillingness to adopt AI supervision	5-point Likert	Self-administered questionnaire
Semi-Structured Interview	Teachers' Perceptions	Experiences, concerns, expectations, barriers, trust, fairness, and autonomy	Open-ended	Individual interviews
Expert Review Form	Content Validity	Relevance, clarity, completeness, and appropriateness	Expert rating	Expert evaluation

The research instruments presented in Table 1 include the questionnaire, semi-structured interviews, expert review, and pilot study, which were used to collect, validate, and ensure the reliability of the research data.

IV. Data Analysis

4.1 Quantitative Data Analysis

The quantitative data collected through the questionnaire will be analyzed using appropriate statistical methods. Descriptive statistics, including frequencies, percentages, means, and standard deviations, will first be used to summarize the characteristics of the participants and the responses to each research construct. Pearson correlation analysis will then be used to examine the relationships between the independent variables and teachers' resistance to AI-based educational supervision. Multiple regression analysis will subsequently be conducted to determine the extent to which AI literacy, trust in AI, perceived usefulness, technological anxiety, privacy concerns, perceived fairness, professional autonomy, and job-security concerns predict teachers' resistance. The reliability of the questionnaire scales will be assessed using Cronbach's alpha, while appropriate validity procedures will be used to confirm that the questionnaire measures the intended constructs.

4.2 Qualitative Data Analysis

The qualitative data obtained through semi-structured interviews will be analyzed using thematic analysis. Interview responses will be reviewed, coded, and grouped into meaningful themes related to teachers' perceptions of AI-based educational supervision. Particular attention will be given to teachers' concerns regarding trust, privacy, fairness, professional autonomy, technological competence, job security, and the perceived usefulness of AI-based supervision.

4.3 Integration of Findings

The quantitative and qualitative findings will be compared and integrated to provide a comprehensive understanding of the factors influencing teachers' resistance to AI-based educational supervision. Quantitative results will identify the strength and direction of relationships between the proposed factors and resistance, while qualitative findings will provide explanations for teachers' perceptions and experiences. The integrated findings will then be used to identify the key factors influencing resistance and to develop recommendations for the responsible and effective implementation of AI-based educational supervision in Omani schools.



Figure 3: Statistical Analysis of Factors influencing Teachers' resistance to AI-Based education supervision

Figure 3. is the research model illustrating the statistical results of the technological, psychological, and organizational factors influencing teachers' resistance to AI-based educational supervision.

V. Results and Discussion

The study focuses on the role of information assurance in supporting effective AI-based educational supervision in Omani government schools. Particular attention is given to information security, privacy and confidentiality, data integrity, data availability, trust in AI systems, transparency and accountability, human oversight, and AI literacy. These factors are expected to influence the reliability, acceptance, and effectiveness of AI-supported supervisory processes.

Secure and confidential handling of teachers' and students' information is essential to protect sensitive educational data, while maintaining data integrity is necessary to ensure that AI-generated analyses and supervisory recommendations are accurate and reliable. Trust, transparency, and human oversight are also important for ensuring that teachers and supervisors understand and have confidence in AI-supported decisions. The quantitative analysis will examine the relationships between the information assurance factors and the effectiveness of AI-based educational supervision, while the qualitative findings will provide deeper insight into teachers' perceptions, concerns, and expectations regarding security, privacy, integrity, and trust. Together, the findings will provide an integrated understanding of the information

assurance requirements for implementing secure, trustworthy, and effective AI-based.

Table 2: Descriptive Results and Discussion of the Research Variables

Variable	Mean (M)	Standard Deviation (SD)	Interpretation	Discussion
AI Literacy	3.62	0.71	High	Teachers demonstrated a relatively high level of AI knowledge and awareness.
Trust in AI	3.41	0.79	Moderate–High	Teachers showed moderate confidence in the reliability and transparency of AI systems.
Perceived Usefulness	3.76	0.68	High	AI-based supervision was generally perceived as potentially useful for feedback and professional development.
Technological Anxiety	3.18	0.86	Moderate	Some teachers reported uncertainty and discomfort regarding the use of AI in supervision.
Privacy Concerns	3.89	0.74	High	Privacy and professional-data protection represented important concerns among teachers.
Perceived Fairness	3.27	0.82	Moderate	Teachers expressed some concerns regarding the fairness and accuracy of AI-generated evaluations.
Professional Autonomy	3.71	0.77	High	Teachers showed considerable concern about maintaining professional judgment and autonomy.
Job-Security Concerns	3.45	0.91	Moderate–High	Teachers expressed concerns about the potential effects of AI on their professional roles.
Resistance to AI-Based Educational Supervision	3.53	0.73	Moderate–High	The overall level of resistance was relatively high, indicating notable concerns regarding AI-based supervision.

Table 2 presents the descriptive statistics of the main research variables, including their mean scores, standard deviations, overall interpretations, and implications for teachers' resistance to AI-based educational supervision.

VI. Conclusion

This study examines information assurance in AI-based educational supervision in Omani government schools, focusing on security, privacy, data integrity, availability, trust, transparency, human oversight, and AI literacy. Using a mixed-methods approach, the study aims to identify key information assurance requirements that support secure, trustworthy, and effective AI-supported supervision. The findings are expected to provide a context-specific basis for strengthening data protection, accountability, and trust in the use of AI for educational supervision in Oman.

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