CHAPTER ONE

Role of Generative Artificial Intelligence in Transforming Supervision Dynamics in Postgraduate Education: A Systematic Literature Review

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Abstract: Postgraduate supervision plays a critical role in shaping research outcomes, student development, and the mentor-mentee relationship. However, traditional supervision practices, often characterised by limited flexibility and heavy reliance on supervisors, can constrain student growth. The emergence of GenAI presents new opportunities for personalised guidance, faster communication, and increased student autonomy. This study explores the role of GenAI in transforming mentor-mentee relationships, identifying potential benefits and implications for postgraduate education. Adopting a qualitative approach, this study conducted a PRISMA-guided systematic review of relevant literature across Scopus, Web of Science, IEEE Xplore, ScienceDirect, Springer, and Google Scholar. The findings indicate that GenAI enhances supervision by improving feedback and critical thinking, promoting student autonomy and motivation, and introducing considerations for ethical and academic integrity. Effective implementation of GenAI in postgraduate education requires a balanced approach that leverages technological advancements while preserving the relational and empathetic aspects of mentor-mentee interactions. Overall, this study underscores the need for further research to investigate the long-term effects of GenAI on academic supervision and to establish best practices for integrating AI tools that enhance, rather than undermine, the mentorship experience. The study relied on secondary data, and future studies should focus on collecting primary data on the role of artificial intelligence in the mentor-mentee relationship.

Keywords: Generative-artificial intelligence, higher education, mentor-mentee, postgraduate supervision, technology-enhanced supervision.

1. Introduction

Artificial Intelligence (AI) has become a prominent topic in public discourse, with growing discussions about its transformative potential. AI is increasingly making its presence felt across various sectors of the economy, such as health, finance, retail, manufacturing, and education, among others. In the context of this study, we focus on generative artificial intelligence tools, which are a subset of AI. Generative artificial intelligence (GenAI) is transforming educational practices by reshaping how students access and engage with learning content (Geerling et al.,

2023). GenAI provides students with more immediate access to information and learning resources, which may contribute to improved learning outcomes. However, if educational assessments are not designed to account for GenAI tools, there is a risk that students may attain academic qualifications without demonstrating genuine understanding or critical thinking.

At the postgraduate level, academics' interest in discussions surrounding GenAI is rapidly increasing due to its ability to provide personalised learning experiences for students and track learner output. Moreover, GenAI has enabled students to conduct extensive research amidst concerns over compromised academic integrity. Students' approaches to writing formative and summative assignments have undergone significant changes due to GenAI-powered text creation tools, necessitating that academic supervisors understand how to effectively integrate these tools into the management of traditional assignment responsibilities (Duvignau, 2024). GenAI is increasingly transforming postgraduate supervision and reshaping the mentor–mentee relationship. Literature highlights improvements in communication, personalised guidance, dialogue quality (Lewis & Clutterbuck, 2019), shortened supervision timelines (George, 2023; Vos & Armstrong, 2019), efficient task administration, supervisor diligence, increased autonomy, and enhanced ethical monitoring. These developments underscore the evolving role of AI in contemporary supervision practices.

Postgraduate students undertake research studies under the supervision of one mentor or a research team. In traditional supervision models, limited tools foster over-reliance on supervisor guidance, restricting independent problem-solving. These arrangements are frequently marked by long turnaround times for feedback, poor planning, and occasionally strained mentor-mentee interactions (Dai et al., 2023; Paulsen & Schmidt-Crawford, 2017). Although this is the case, some authors, such as Bouzar et al. (2025), argue that traditional supervisory models are invaluable for their engagement and contextual relevance as a role model in physical space for the mentee. Academic sources (Lewis & Clutterbuck, 2019; Bearman, Boud, & Konradsen, 2025) report that AI has the potential to support postgraduate supervision and that GenAI-generated supervisor feedback can be easily accessible and understandable. However, empirical studies proving that supervisors have used it are scarce (Thong et al., 2025). Despite this scarcity, there is overwhelming evidence of students using AI for their assignments, with most universities worldwide significantly affected (Duvignau, 2024). Consequently, managing the quality of research output becomes problematic (Bjelobaba et al., 2024; Chauhan & Currie, 2024). While AI offers students greater autonomy in defining research directions and preparing initial drafts, it can also undermine critical thinking and originality (Aymen & Zakarya, 2024). This challenge places a burden on supervisors to support mentees in almost equal measure to the traditional supervision model.

1.1 Problem statement

In an ideal postgraduate supervision environment, supervision is characterised by regular, meaningful interaction between supervisors and students, timely feedback, mutual trust, and sustained academic mentorship that supports both scholarly development and personal growth. However, this ideal has become increasingly difficult to maintain in many higher education institutions. Growing postgraduate enrolments have significantly increased supervisors' workloads, placing additional administrative and academic demands on them that are manageable with smaller cohorts. At the same time, the shortage of qualified and available mentors has resulted in extended supervision periods, further straining the supervisory process and challenging the effectiveness of traditional supervision models (Chapman et al., 2021; Gallacher, 1997; Malik & Malik, 2015). The increasing demand to revamp traditional supervision models calls for more dynamic and flexible approaches that prioritise student autonomy, strengthen mentor–mentee relationships, and provide continuous feedback (Kimani, 2014). Despite extensive literature on conventional postgraduate supervision, there is a lack of research examining how GenAI can enhance the postgraduate supervisory experience. Innovative ways to improve the effectiveness of mentoring and supervision are becoming increasingly necessary as postgraduate education grows more challenging and complex. By providing tools and systems that can revolutionise the way mentoring and supervision are conducted, GenAI holds promise for addressing these issues. However, there are also significant concerns about how GenAI will affect the mentor-mentee relationship, supervisory dynamics, and ethical issues when incorporated into postgraduate education (Köbis & Mehner, 2021).

Based on the highlighted problem, the study is guided by the following research questions:

i. How can GenAI be used to transform mentor-mentee relationships and supervision dynamics in postgraduate education?
ii. What institutional, cultural, and ethical factors influence the effective and responsible use of GenAI in postgraduate supervision?

2. Methodology

This study employed a qualitative systematic literature review (SLR) to critically investigate the evolving role of GenAI in shaping mentor-mentee relationships and supervision dynamics within postgraduate education. The selection of an SLR was informed by its capacity to facilitate a comprehensive, transparent, and reproducible synthesis of peer-reviewed scholarly evidence, particularly relevant in a rapidly advancing and multidisciplinary field such as GenAI in education. The review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure methodological rigour and compliance with best practices in evidence synthesis. This methodological framework guided the structured identification, screening, and inclusion of relevant literature, ensuring analytical coherence in mapping the conceptual and thematic contours of GenAI's impact on postgraduate supervision. By situating the review within a rigorous and transparent framework, the study seeks to provide

substantive insights into the ways in which GenAI technologies reshape traditional supervisory models and pedagogical relationships. Data were collected from six (6) databases: Scopus, Web of Science, IEEE Xplore, ScienceDirect, Springer, and Google Scholar. These databases were selected for this scoping review due to their extensive coverage of high-quality, peer-reviewed literature in the fields of education, technology, and artificial intelligence. The term 'artificial intelligence' was utilised as part of our search string instead of 'Generative AI' to avoid constraining the retrieved articles. Table 1 presents a list of the search strings employed in this study.

Table 1: *Search Strings used for Document Identification*

Database	**Search String**
Scopus	("artificial intelligence" OR "machine learning" OR "deep learning" OR "AI-driven" OR "intelligent tutoring system" OR "chatbot" OR "automated feedback" OR "predictive analytics") AND ("mentorship" OR "mentor-mentee relationship" OR "academic supervision" OR "postgraduate supervision" OR "graduate advising" OR "doctoral supervision" OR "PhD mentorship") AND ("higher education" OR "postgraduate education" OR "graduate studies" OR "doctoral education" OR "university learning environments" OR "supervision dynamics")
Web of Science	("artificial intelligence" OR "machine learning" OR "deep learning" OR "AI-driven" OR "intelligent tutoring system" OR "chatbot" OR "automated feedback" OR "predictive analytics") AND ("mentorship" OR "mentor-mentee relationship" OR "academic supervision" OR "postgraduate supervision" OR "graduate advising" OR "doctoral supervision" OR "PhD mentorship") AND ("higher education" OR "postgraduate education" OR "graduate studies" OR "doctoral education" OR "university learning environments" OR "supervision dynamics")
IEEE Xplore	postgraduate supervision and education
ScienceDirect	("artificial intelligence") AND ("supervision mentorship" OR "postgraduate mentorship" OR "academic supervision" OR "postgraduate supervision") AND ("higher education" OR "graduate studies" OR "doctoral education" OR "university learning")
Springer	("artificial intelligence") AND ("mentor-mentee relationship" OR "academic supervision" OR "postgraduate supervision" OR "graduate advising" OR "doctoral supervision" OR "PhD mentorship") AND ("higher education" OR "postgraduate education" OR "graduate studies" OR "doctoral education" OR "university learning environments" OR "supervision dynamics")
Google Scholar	("artificial intelligence") AND ("postgraduate supervision" OR "graduate advising") AND ("higher education" OR "postgraduate education" OR "graduate studies" OR "university learning environments" OR "supervision dynamics")

Search strings were generated for each database. The initial database search retrieved 493 records from the six databases, as illustrated in Figure 1. Among the 493 records identified, there was an overlap, as the same records were retrieved from different databases. Overall, 28 duplicate records were excluded, leaving 465 records to be screened. We used the article titles and abstracts to further screen the records based on the eligibility criteria outlined below. Four hundred and fifty (450) records were excluded as they met the exclusion criteria, leaving us with 15 records. We then successfully retrieved all 15 records and reviewed the full texts of each to determine

whether they met the inclusion criteria. A further two records were excluded, resulting in a total of 13 articles to be included in the review. To increase the number of studies included in the analysis, additional searches were conducted using the Google search engine, from which three further studies were identified and added. In total, sixteen studies were included in the final analysis, as they met the study's inclusion criteria.

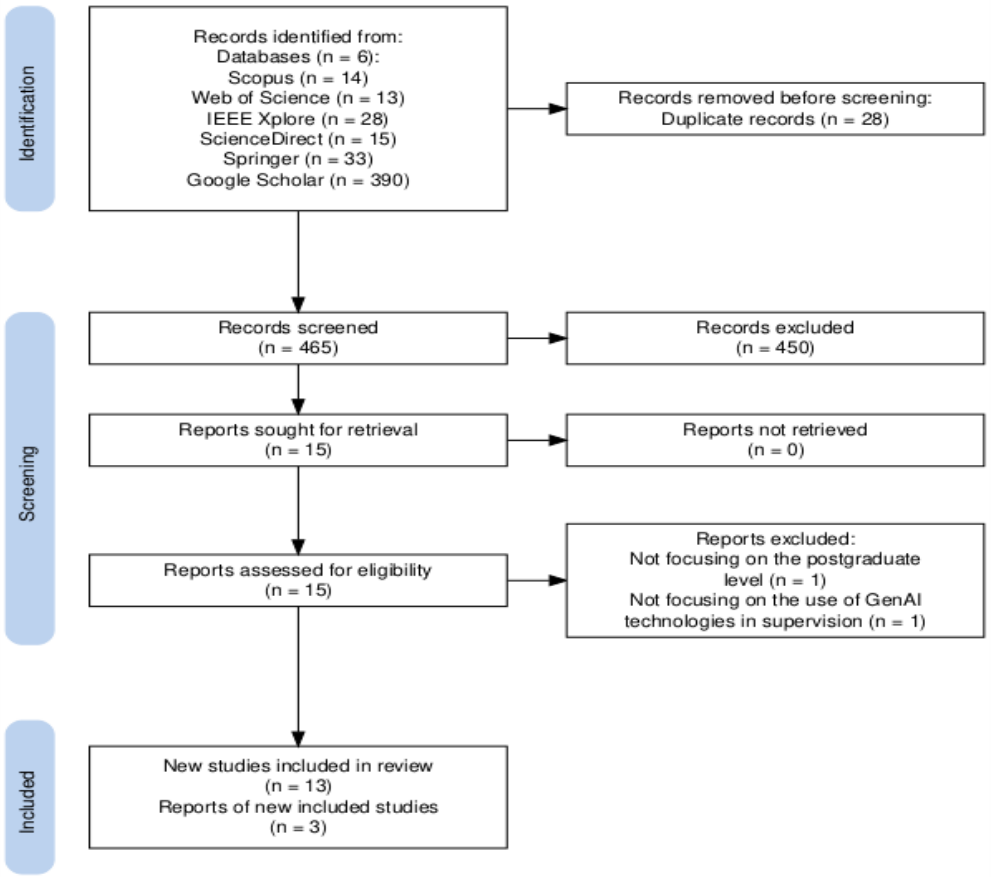

Figure 1: *PRISMA flow diagram of the study's screening process*

NB: The search string used to identify documents from IEEE Xplore was broadened to retrieve more documents, as the initial search string retrieved only one paper from the databases.

Eligibility for inclusion in this study was determined based on a clear set of scope-related considerations. Only full-text, peer-reviewed studies written in English were considered. The review specifically focused on studies examining the use of generative AI technologies within the context of postgraduate supervision. To ensure relevance, included studies had to concentrate on the postgraduate level and explicitly address aspects of the mentor-mentee relationship and/or the supervision process. Studies that did not meet these criteria—such as those unrelated to generative AI, not focused on postgraduate education, not addressing supervision or mentoring, or not published in English—were excluded from the review. The documents selected for analysis in this study are listed in Tables 2a and 2b.

Table 2a: Documents analysed

No.	Authors	Year	Title	Study Design	Types of AI
1	Wright, A	2024	Postgraduate Supervision in a ChatGPT World: What's Next?	Qualitative literature review	GenAI
2	Jensen, L.X., Bearman, M., Boud, D. and Konradsen, F	2025	Feedback encounters in doctoral supervision: the role of generative AI chatbots	Innovative research	GenAI chatbot
3	Chang, C.N., Hui, J., Justus-Smith, C. and Wang, T.W	2024	Navigating STEM careers with AI mentors: a new IDP journey	Mixed methods	GenAI
4	Thong, C.L., Atallah, Z., Islam, S., Lim, W. and Cherukuri, A. K	2025	AI-Powered Tools for Doctoral Supervision in Higher Education: A Systematic Review	Systematic Review	GenAI, LLM, NLP, ITS, AI-powered chatbots, AI for assessments, Predictive modelling, and learning analytics
5	Dai, Y., Lai, S., Lim, C.P. and Liu, A	2023	ChatGPT and its impact on research supervision: Insights from Australian postgraduate research students	Qualitative	GenAI
6	Bouzar, A., El Idrissi, K., Ghourdou, T. and Ali, N	2025	Supervisory Feedback vs. AI: A Comparative Study on Postgraduate Student Satisfaction	Cross-sectional	GenAI
7	Harding, D. and Boyd, P	2024	Generative AI and PHD supervision: a covert third wheel or a seat at the table?	Qualitative exploration	GenAI
8	Mhlanga, D. and Ndhlovu, E	2024	Digital transformation in higher education and postgraduate research supervision in Africa: A critique of 4IR-based interventions in open distance education	Critical document analysis	4IR
9	Ndjuluwa, L., Adebisi, J.A. and Abdulsalam, K.A	2024	A Review on Digital Tools for Engineering Postgraduate Education in post-Covid Era	Systematic literature review	Digital tools
10	Iwashokun, O. and Ade-Ibijola, A	2022	Structural Vetting of Research Proposals: Problematisation and Solving with Artificial Intelligence	Mixed methods	Grammarly, ProWritingAid, Paperrater, Typely, Wordy, Chatbots, ITS, VR, serious games, genAI in education

Table 2b: Documents Analysed

No.	Authors	Year	Title	Study Design	Types of AI
11	Serek, A. and Zhaparov, M	2024	Optimising preference satisfaction with a genetic algorithm in matching students to supervisors	Experimental	Genetic algorithm

12	Juma, M. N	2024	Navigating the ChatGPT Theological Terrain: Considerations for Graduate Theology Students	Qualitative literature review	GenAI
13	Sim, K.N., Northcote, M. and Lim, C. P	2023	Technology-enabled undergraduate and postgraduate research supervision	Conceptual thematic review	ChatGPT and language models
14	Mbodia, M	2025	Postgraduate Supervision in the Age of ChatGPT: Redefining the Role of Supervisors	Literature review	GenAI
15	Boyd, P. and Harding, D	2025	Generative AI: reconfiguring supervision and doctoral research	Mixed methods	GenAI
16	Iatrellis, O., Bania, A., Samaras, N., Kosmopoulou, I. and Panagiotakopoulos, T	2025	ChatGPT in doctoral supervision: Proposing a tripartite mentoring model for AI-assisted academic guidance	Structured evaluation	GenAI

Thematic analysis was employed in this study. Atlas.ti was used for analysis purposes to create codes and themes, following the six steps outlined by Clarke and Braun (2026). The steps included: familiarisation, coding, generating themes, reviewing themes, defining and naming themes, and writing up.

3. Presentation of Results

The study followed Braun and Clarke's (2006) six steps for analysing qualitative data thematically. The results are presented as themes, as shown in Table 3. Activity Theory was employed as the lens to guide the investigation, as it provides a comprehensive framework for understanding human activity systems, including the interactions between individuals, tools, rules, and the community. This approach allows for a deeper analysis of how these elements influence and shape the focus of the study.

Table 3: *Themes and codes*

Theme	**Codes**
GenAI as a complementary tool in supervision	GenAI as a complementary tool Complementary role of GenAI GenAI as a supervisor Hybrid supervision model GenAI for supervision efficiency
Ethical and academic integrity concerns	Ethical ambiguity Ethical concerns GenAI and academic integrity Privacy issues Misinformation risk
Shifting roles of supervisors and mentees	Evolving role of the supervisor Changing supervisor roles Mentor role redefinition Student agency

GenAI-enhanced feedback and critical thinking	GenAI clarity vs supervisor clarity Formative value of feedback Critical thinking aid Engagement in human supervision
Institutional and cultural readiness	Need for institutional guidance Institutional support Cultural and contextual influences Resource constraints GenAI literacy needs
Student autonomy and motivation	Autonomy boost Dependence vs critical thinking Overreliance concerns Agency and control Student-driven ICT use
Technological and pedagogical integration	Technology-enhanced supervision Pedagogy of supervision Education 4.0 and digital transformation GenAI in postgraduate supervision Predictive algorithms

3.1 GenAI as a complementary tool in supervision

This theme explores the supportive role of artificial intelligence in postgraduate supervision, emphasising its function as a complementary tool rather than a replacement. GenAI enhances supervision by increasing efficiency and addressing shortcomings in traditional models without displacing the human supervisor (Jensen, Bearman, Boud & Konradsen, 2025; Boyd & Harding, 2025; Iatrellis et al., 2025). It assists by automating repetitive tasks such as structural feedback, grammar checks, and initial content vetting, thereby reducing supervisors' workload (Iwashokun & Ade-Ibijola, 2022; Serek & Zhaparov, 2024). GenAI also aids in brainstorming, literature reviews, drafting, clarifying concepts, and synthesising data (Mbodia, 2025; Boyd & Harding, 2025). This enables supervisors to dedicate more time to intellectual guidance and emotional support, fostering a more balanced and human-centred supervisory relationship (Dai et al., 2023). AI-driven platforms like ChatGPT thus contribute to a hybrid supervision model, where GenAI handles routine academic support while human supervisors retain critical mentoring. Additionally, GenAI can help bridge gaps in supervision quality, especially where students may not receive consistent or timely guidance, offering accessible mentorship and academic reinforcement (Harding & Boyd, 2024). Supervisors have the responsibility of guiding students to use AI critically and selectively (Mbodia, 2025).

3.2 Ethical and academic integrity concerns

This theme highlights the complex ethical dilemmas surrounding the integration of GenAI into postgraduate supervision, particularly regarding plagiarism, authorship, false citation, data security, risks of over-reliance, authenticity of voice, and unacknowledged use, all of which influence academic integrity (Mbodia, 2025; Boyd & Harding, 2025; Iatrellis et al., 2025). Wright (2024) notes ongoing uncertainty about how AI-generated content should be governed within

educational settings. Dai et al. (2023) caution against over-reliance on GenAI tools, citing risks such as algorithmic bias and diminished opportunities for authentic learning. Overreliance on AI can reduce intrinsic motivation and independence in problem-solving (Iatrellis et al., 2025). Juma (2024) and Harding and Boyd (2024) warn that GenAI may compromise the integrity of academic work and the pedagogical value of the supervisory process. Additionally, Chang et al. (2024) raise critical concerns about data privacy, information security, and the potential for GenAI to produce inaccurate or misleading outputs, which could misguide both mentors and mentees. These ethical challenges underscore the urgent need for clear institutional policies and guidelines to ensure the responsible and constructive use of GenAI in supervisory contexts (Mbodia, 2025).

3.3 Shifting roles of supervisors and mentees

The roles of supervisors and mentees are undergoing a significant transformation due to the integration of GenAI in postgraduate education. The study by Wright (2024), Mbodia (2025), and Boyd and Harding (2025) shows that supervisors' roles are shifting from traditional directive approaches to facilitative, co-learning methods that emphasise GenAI literacy while fostering student autonomy. As technology is integrated into academic practice, there is a change in supervisory roles to support not just academic development, but also relational and reflective mentoring (Dai et al., 2023). This shift reflects a broader trend towards cultivating autonomy and critical thinking, with supervisors acting as collaborators in navigating digital technologies (Chang et al., 2024; Sim et al., 2023). Similarly, mentees are transitioning from passive recipients of knowledge to self-directed, autonomous researchers who utilise GenAI tools, such as ChatGPT, to guide their academic journeys (Dai et al., 2023). Students take on the role of critical evaluators and synthesisers of AI outputs, which is a complementary and defined task (Iatrellis et al., 2025). However, if GenAI is adopted uncritically, it may function as a surrogate mentor, subtly reshaping supervision and, in some cases, marginalising the role of the human supervisor (Boyd & Harding, 2025). This evolving dynamic calls for redefined expectations, responsibilities, and skill sets in the supervision relationship.

3.4 GenAI-enhanced feedback and critical thinking

This study explores the evolving role of Generative Artificial Intelligence (GenAI) in providing feedback and fostering critical thinking within the context of postgraduate supervision. GenAI tools, such as ChatGPT, Perplexity, Scite, Elicit, among others, are often perceived as capable of providing clear and immediate feedback, with some mentees finding such feedback to be more comprehensible than that provided by human supervisors (Bouzar et al., 2025; Mbodia, 2025). Furthermore, GenAI assists students in rehearsing responses, clarifying feedback, and building confidence prior to engaging with their supervisors (Boyd & Harding, 2025). Nevertheless, given that GenAI operates as a "devil's advocate" to stimulate critical thinking (Dai et al., 2023), it lacks the pedagogical depth and contextual understanding that human

supervisors can offer (Jensen et al., 2025). GenAI feedback is typically task-oriented and focuses on superficial enhancements, whereas supervisors play a pivotal role in aiding students' development of their intellectual scholarly identity and higher-order thinking skills (Jensen et al., 2025; Mbodia, 2025). The findings indicate that while GenAI can enhance the feedback process, it cannot supplant the development, rational guidance, and individualised support that human supervisors provide (Bouzar et al., 2025).

3.5 Institutional and cultural readiness

The theme of institutional and cultural readiness emphasises the crucial role of institutional support and cultural context in effectively integrating GenAI into postgraduate supervision. The studies by Bouzar et al. (2025) and Wright (2024) highlighted the need for structured frameworks, clear policies, and training programmes that can guide mentees and supervisors in using GenAI tools ethically and effectively. Mbodia (2025), Iatrellis et al. (2025), and Boyd and Harding (2025) noted a lack of clear guidelines for the use of AI in higher education institutions. According to Sim et al. (2023), institutional context and cultural background significantly impact how ICT and GenAI tools are perceived and used, necessitating local approaches. However, resource limitations, such as limited access to reliable internet and computers, remain significant barriers, especially in disadvantaged institutions (Mhlanga & Ndhlovu, 2024). These disparities in resources create inequalities among university students (Mbodia, 2025). Institution-wide GenAI literacy training fosters confidence, ensures responsible use, and promotes fair participation in AI-enabled academic settings (Dai et al., 2023).

3.6 Student autonomy and motivation

The theme of student autonomy and motivation explores the dual roles of GenAI tools, such as ChatGPT, in promoting student motivation and autonomy in postgraduate supervision. ChatGPT provides immediate on-demand support, enhancing student confidence, reducing dependency on supervisor availability, and promoting self-directed learning by minimising the need for supervisors for routine queries (Dai et al., 2023; Boyd & Harding, 2025; Iatrellis et al., 2025). Due to the accessibility of some GenAI tools, students are empowered to take greater control of their academic progress, particularly by allowing them to seek feedback on their own terms, thus enhancing their perceived agency (Jensen et al., 2025). Similarly, Sim et al. (2023) and Mbodia (2025) emphasise the autonomous use of ICT tools, such as ChatGPT and learning management systems (LMS), by students to guide their research and learning processes. However, concerns such as overdependence arise with the growing use of GenAI, which may hinder the development of critical thinking and problem-solving skills (Chang et al., 2024; Wright, 2024).

3.7 Technological and pedagogical integration

This theme explores the growing convergence of technology and pedagogy in postgraduate research supervision. Integrating GenAI tools into postgraduate supervision has significantly improved supervisory practices by enabling more flexible, responsive, and accessible mentoring (Sim et al., 2023). The use of digital technologies, such as AI, in education is shaping the way supervision is conducted and redefining mentoring approaches to align with the evolving needs of students. AI-driven tools, such as ChatGPT, are being utilised to support supervision in a technology-driven, student-centred environment, in line with Education 4.0 trends (Iwashokun & Ade-Ibijola, 2022; Leokadia et al., 2024). These tools enhance academic engagement, streamline feedback, and facilitate collaboration across digital platforms. Furthermore, the use of machine learning algorithms in supervision enables personalised academic support by predicting mentees' needs and offering tailored guidance (Thong et al., 2025). The adoption of hybrid supervision models, where AI tools are blended with traditional mentorship, is recommended for successful postgraduate supervision (Mbodia, 2025). However, the integration of GenAI in postgraduate supervision remains ad hoc and often hidden (Boyd & Harding, 2025).

4. Discussion of Findings

This chapter explores the role of GenAI in transforming mentor-mentee relationships and supervisory dynamics in postgraduate education. The findings of this study indicate a growing institutional shift from initial resistance to the gradual adoption of these technologies within the sampled contexts. However, the extent to which this shift is widespread across the broader higher education sector remains uneven and context-dependent, suggesting the need for further large-scale and multi-institutional studies to establish the generalisability of this trend. The key findings of this of study were: (1) using GenAI as a complementary tool in supervision; (2) the shifting of supervisor and mentee roles; (3) using GenAI for enhanced feedback and critical thinking; (4) student autonomy and motivation; (5) institutional and cultural readiness; and (6) ethical and academic integrity concerns.

Resonating with social learning concepts, knowledge cannot be separated from the environment in which it was produced. The environment encompasses its people, the tools involved, and the systems in place. The flexibility in communication aligns with the principles of Activity Theory, where tools mediate the relationship between subjects and objects. Evidence consistently demonstrates that mediation tools, especially in the early stages of integrating large language models like ChatGPT, significantly enhance student learning experiences by supporting engagement, comprehension, and personalised learning (Dai et al., 2023; George, 2023; Matobobo et al., 2025). Based on the study's results, it is evident that the use of GenAI in education has expanded the number of mediating artefacts available for research, which in turn impacts the effectiveness of mentoring. Researchers have lamented that while GenAI tools are beneficial for supervision, institutions must ensure that learners have a solid foundation in the fundamental principles of the subject and utilise the complementary aspects of the tools rather

than replacing supervisors. For mentees to generate effective prompts, they must possess a foundational understanding of the subject matter. Without sufficient knowledge, there is a greater risk of being misled or producing superficial inputs that lack critical depth. A firm grasp of the topic allows mentees to engage meaningfully with AI tools, enabling them to frame precise and thoughtful queries. Research in education and cognitive science consistently shows that domain knowledge enhances critical thinking and the ability to evaluate information effectively. When used correctly and with appropriate subject knowledge, these tools can significantly amplify the quality of work produced. While some argue that tools like GenAI can fill knowledge gaps (Yagyaeva et al., 2024), they are most effective when guided by an informed user who can evaluate and refine the output.

The role of the mentor is increasingly shifting towards creativity rather than merely addressing the basics, a transition that can be facilitated by GenAI tools (Sim et al., 2023). Unlike traditional supervision, GenAI assists postgraduate students in independently gathering and analysing relevant literature in a short time, allowing the mentee to delve deeper into their selected phenomena of interest. This shift prepares individuals for the role of academic advisors (Harding & Boyd, 2024). Of course, like any tool, over-reliance on GenAI can result in diminished human interaction. Other factors, such as guidance on the flow of document structure and in-depth analysis of results based on environmental factors, still require human experience and insight (Wright, 2024). Furthermore, it is essential to note that, regardless of whether students use GenAI, the supervisor remains responsible and accountable for the final research output produced by the student. Nonetheless, the immediacy of feedback offered by GenAI tools reduces anxiety for the mentee in cases where the mentor delays responses.

Given the rapid increase in the use of these tools, it should be the prerogative of institutions to develop policies and practices that demonstrate readiness for mentor-mentee relationships in a human-AI collaborative environment. Due to the absence of clear implementation and policy frameworks within institutions, our experience reveals a degree of mistrust among practitioners regarding the integrity of the supervision processes facilitated by GenAI. The findings suggest that cultural readiness enables mentors to guide mentees ethically in the use of artificial intelligence in research. It is important to emphasise that awareness of ethical considerations will lead to a focus on process rather than solely on outcomes.

Additionally, the deployment and use of GenAI in research raise ethical concerns, including data privacy and algorithmic bias. As demonstrated by Dai et al. (2023), these issues necessitate the establishment of clear guidelines and ethical standards to govern the use of AI applications in educational settings. This ensures that technology usage aligns with the overarching goals of education and maintains the integrity of mentor-mentee relationships.

The literature lacks discussion on sustainability. There is significant concern regarding the amount of energy required to train these models. Considering green AI, which involves using

AI to transform mentor-mentee relationships and supervision dynamics in postgraduate education, is essential as its usage rapidly increases. This gap highlights the urgent need to align AI innovation with environmentally conscious and educationally impactful objectives. Furthermore, the study's findings are inconclusive regarding whether AI is geared towards personal development or personal performance, as its use in supervision continues to grow.

5. Conclusions

This study concludes that Generative Artificial Intelligence (GenAI) possesses significant potential to reshape postgraduate supervision, particularly by influencing the mentor-mentee relationship and supervisory practices within higher education. The reviewed literature consistently indicates that GenAI tools can enhance efficiency in supervision by supporting tasks such as feedback generation, idea exploration, academic writing assistance, and administrative support. These capabilities have the potential to alleviate supervisors' workloads and improve students' access to timely academic guidance. However, the findings also affirm that GenAI cannot replace the uniquely human dimensions of postgraduate supervision. Core supervisory functions, such as providing emotional support, fostering trust, offering contextual and disciplinary judgement, and guiding students' scholarly identity development, remain inherently human. The literature emphasises that effective supervision depends on relational, ethical, and developmental elements that GenAI systems are currently unable to replicate.

Furthermore, the study highlights the necessity for a balanced and complementary integration of GenAI into supervisory practices. While GenAI can augment supervision, unethical or excessive reliance on these tools risks undermining academic integrity, student agency, and the quality of mentorship. Ethical challenges, including bias, transparency, accountability, and data privacy, position supervisors as essential gatekeepers responsible for ensuring the responsible and ethical use of GenAI in postgraduate contexts. Hence, the study concludes that GenAI should be understood as an enabling technology that supports, rather than substitutes for, human mentorship. Its value lies in complementarity rather than replacement, reinforcing the continued centrality of the supervisor in postgraduate education.

6. Recommendations and Limitations of the Study

Based on the findings of this study, several recommendations are proposed for higher education institutions, supervisors, and policymakers:

- Higher education institutions should develop clear policies and frameworks that guide the ethical and pedagogically sound utilisation of Generative Artificial Intelligence (GenAI) in postgraduate supervision. These frameworks should define acceptable use, outline responsibilities for both supervisors and students, and address issues related to academic integrity, data protection, and transparency.
- Universities should invest in training programmes for supervisors and postgraduate students to enhance their literacy in GenAI. Such initiatives should focus on developing

a critical awareness of GenAI's capabilities and limitations, thereby enabling users to leverage these tools effectively while maintaining scholarly rigour and ethical standards.

- Supervision models should explicitly foreground the irreplaceable human aspects of mentorship, including emotional support, ethical judgement, and personalised guidance. GenAI should be positioned as a supplementary tool that enhances efficiency, allowing supervisors to dedicate more time to high-level intellectual engagement and relational support.
- Institutions should establish mechanisms for the continuous evaluation of GenAI use in postgraduate supervision. This includes monitoring unintended consequences, addressing emerging ethical concerns, and ensuring that GenAI adoption aligns with sustainability, inclusivity, and student well-being objectives.

From a methodological standpoint, the main limitation of this study lies in its reliance on secondary data. Furthermore, supervision practices vary significantly depending on institutional context and individual supervisory styles, which may affect the generalisability of the findings. Despite these limitations, the study provides a valuable foundation for future research. Subsequent studies should incorporate primary data collection to explore the lived experiences of both mentors and mentees, offering deeper insights into how GenAI can be effectively and responsibly integrated into postgraduate supervision.

7. Declarations

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