

# Exploring Digital Supervision Practices and their Impact on Graduate Research Skills: A Qualitative Study of Supervisory Effectiveness at Al-Madinah International University, Malaysia

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## Abstract

This study aims to explore digital supervision practices and their impact on the development of research skills among postgraduate students at the Faculty of Education, Al-Madinah International University, Malaysia. Employing a qualitative approach, semi-structured interviews were conducted with 18 master's and doctoral students, and the data were analyzed thematically to identify patterns and meanings emerging from participants' narratives. Findings are organized around four main themes: Strategic Digital Vision, Digital Tools as Enablers, Leadership Competencies and Supervisory Capacity, and Digital Infrastructure as a Moderating Factor. The results indicate that digital supervision positively influences the development of core research competencies, including critical thinking, academic writing, literature review organization, and collaborative planning. Its effectiveness, however, depends on the presence of a clear strategic digital vision, competent leadership, appropriate digital tools, and reliable infrastructural support. This study makes a qualitative contribution by foregrounding postgraduate students' lived experiences, addressing a gap in the literature regarding the human and relational dimensions of digital supervision in higher education. The findings highlight the necessity of articulating clear strategic frameworks, providing targeted professional development for supervisors, and investing in robust digital infrastructure to ensure effective supervision. The study also suggests avenues for future research, including comparative and longitudinal studies, to further examine how digital supervision impacts research skill development over time.

**Keywords:** Digital Supervision Practices, Graduate Research Skills, Supervisory Effectiveness, Digital Academic Leadership, Qualitative Research, Graduate Studies, Higher Education, Malaysia

### Background of the Study

In recent years, higher education has experienced significant shifts in the way academic work is organized, delivered, and supported. The integration of digital technologies into university systems has not only transformed teaching and learning practices but has also reshaped communication patterns, research processes, and academic mentoring. Institutions increasingly rely on digital platforms to manage academic interaction, facilitate collaboration, and ensure continuity across diverse and often geographically dispersed student populations. As universities adapt to these changes, key academic responsibilities particularly those related to research training and postgraduate guidance are being reconsidered within digitally mediated environments.

Digital transformation has become a defining feature of contemporary higher education, particularly in postgraduate programs where supervision plays a central role in students' academic success. Digital supervision refers to the use of online platforms, virtual communication tools, shared documents, and institutional learning management systems to support the supervision process. These practices aim to enhance flexibility, continuity, and access to academic guidance, especially in institutions with culturally and geographically diverse graduate student populations, such as international universities in Malaysia (Selwyn, 2022; Kasim et al., 2023).

Empirical evidence suggests that digital supervision can improve communication frequency, clarity of feedback, documentation, and monitoring of student progress. For example, a recent systematic review found that online supervision promotes stronger interaction between students and supervisors and enhances overall supervisory support, highlighting patterns in mentoring tools, communication dynamics, and student satisfaction (Kasim et al., 2023).

Despite these positive findings, much of the existing research has looked at supervision effectiveness at an institutional or supervisory level, often using quantitative designs or broad measures of satisfaction and completion. For instance, studies on the use of information and communication technology (ICT) in postgraduate supervision report increased engagement when digital tools are adopted, but they provide limited insight into how these practices influence students' research skill development from the students' own point of view (Maor & Currie, 2017).

While prior studies have explored online or blended supervision and general supervision characteristics, there remains a shortage of qualitative research that truly captures graduate students' lived experiences of digital supervision, especially in terms of how it contributes to the development of core research competencies such as academic writing, literature integration, methodological planning, and critical analysis. This gap persists even as universities increasingly rely on digital environments to support postgraduate research work. Much of the literature tends to focus on technology adoption or administrative processes, rather than on how students interpret and make meaning of these digital supervision practices in relation to their academic growth.

**This study addresses that gap** by providing in-depth qualitative insights into how postgraduate students experience digitally mediated supervision and how these practices

shape the development of essential research skills. Unlike prior work that emphasizes institutional policies or the presence of tools, this research centers students' own voices to explore the relational, pedagogical, and leadership dimensions of digital supervision. By focusing on research skill development rather than solely on satisfaction or process metrics, the study contributes to the social sciences by extending understanding of digital academic leadership, postgraduate pedagogy, and the experiential impact of technology in research supervision contexts.

In the Malaysian context, earlier research on postgraduate supervision has examined organizational and relational factors such as supervision quality and student-supervisor relationships, yet these studies have not sufficiently explored the role that digital supervision plays in shaping students' research capabilities (Sidhu et al., 2013; Kasim et al., 2023). Accordingly, this study explores digital supervision practices and their impact on graduate research skills from the perspectives of postgraduate students at the Faculty of Education, Al-Madinah International University, Malaysia.

### **Problem Statement**

Graduate thesis supervision plays a pivotal role in shaping postgraduate students' research competence, academic progression, and timely completion of their degrees. With the increasing adoption of digital supervision practices such as online meetings, asynchronous feedback, shared digital workspaces, and learning management systems there is greater flexibility in how supervision is delivered. However, despite the widespread use of these tools, there remains limited understanding of how such digital practices influence the development of core research skills, including critical thinking, research design, literature synthesis, and academic writing (Lee, 2018; Selwyn, 2022).

Most existing studies on postgraduate supervision emphasize institutional policies, supervisor behaviors, or measurable outcomes such as student satisfaction and completion timelines. While informative, these studies often treat digital supervision as a technical enhancement rather than a pedagogically significant practice that directly shapes students' research capabilities. Consequently, the impact of digital supervision on skill development remains underexplored, particularly from the perspective of students who experience these practices daily (Polkinghorne et al., 2023; Cheng et al., 2024).

Furthermore, the majority of research on supervision employs quantitative or survey-based methodologies, which capture prevalence or frequency but fail to provide a deep understanding of students' lived experiences. The ways students perceive, interpret, and negotiate digitally mediated supervision especially in relation to their own development as independent researchers are often overlooked (Kasim et al., 2023).

At the Faculty of Education – Al-Madinah International University, Malaysia, graduate students increasingly engage with digital supervision due to hybrid learning models, diverse student populations, and reliance on online platforms for research support. Despite the practical importance of these digital practices, there is limited empirical evidence capturing how graduate students experience digital supervision and how it influences the development of their research skills. Without such qualitative insights, it is unclear whether existing digital

supervision practices effectively foster students' research competence, confidence, and scholarly productivity.

Therefore, this study aims to address the underexplored problem of how digital supervision practices influence the development of graduate research skills from the perspectives of postgraduate students within the Faculty of Education – Al-Madinah International University, Malaysia.

## **Research Objectives**

### *Main Objective*

To explore how digital supervision practices influence the development of graduate students' research skills in the Faculty of Education – Al-Madinah International University, Malaysia.

### *Sub-Objectives*

1. To identify the digital supervision practices implemented by academic supervisors and examine students' perceptions of their effectiveness.
2. To investigate the impact of digital supervision practices on the development of graduate students' research skills, including academic writing, critical thinking, literature synthesis, and research design.
3. To examine the challenges graduate students face in the context of digital supervision and their effects on research progress.
4. To analyze the role of digital tools, institutional support, and leadership practices in facilitating or constraining the effectiveness of digital supervision.
5. To propose recommendations for enhancing digital supervision practices to improve graduate students' research skills and overall supervision quality.

These objectives are designed to address the existing gap in qualitative evidence regarding how digital supervision shapes graduate students' research development and to provide actionable insights for improving supervision practices in a digitally mediated academic environment (Lee, 2018; Polkinghorne et al., 2023; Selwyn, 2022; Kasim et al., 2023).

## **Research Question**

### *Main Research Question*

How do digital supervision practices influence the development of graduate students' research skills in the Faculty of Education – Al-Madinah International University, Malaysia?

### *Sub-questions*

1. What digital supervision practices are currently implemented by academic supervisors, and how do students perceive their effectiveness?
2. How do these digital supervision practices impact the development of graduate students' research skills, including academic writing, critical thinking, literature synthesis, and research design?
3. What challenges do graduate students encounter in the process of digital supervision, and how do these affect their research progress?
4. How do digital tools, institutional support, and leadership practices facilitate or hinder the effectiveness of digital supervision?
5. What recommendations can be proposed to enhance digital supervision practices for improving graduate students' research skills and overall supervision quality?

To enhance conceptual clarity, the study established a clear alignment between its research objectives, research questions, and analytical axes. As shown in Table 1, this alignment structured the qualitative inquiry and guided both data collection and thematic analysis.

Table 1

*Alignment of Research Axes, Objectives, and Research Questions*

Research Axis	Related Objective	Related Research Question	Notes
<b>Digital Supervision Practices</b>	Main Objective: To explore how digital supervision practices influence the development of graduate students' research skills	Main Research Question: How do digital supervision practices influence the development of graduate students' research skills in the Faculty of Education – Al-Madinah International University?	Captures students' lived experiences with digitally mediated supervision, including communication modes, feedback practices, and supervision frequency.
<b>Supervisory Practices and Students' Perceptions</b>	Sub-Objective 1: To identify the digital supervision practices implemented by academic supervisors and examine students' perceptions of their effectiveness	Sub-Question 1: What digital supervision practices are currently implemented by academic supervisors, and how do students perceive their effectiveness?	Focuses on the perceived quality, clarity, responsiveness, and consistency of supervision from the students' perspective.
<b>Impact of Digital Supervision on Research Skills</b>	Sub-Objective 2: To investigate the impact of digital supervision practices on the development of graduate students' research skills	Sub-Question 2: How do digital supervision practices impact the development of graduate students' research skills, including academic writing, critical thinking, literature synthesis, and research design?	Examines learning outcomes and skill development resulting from digital supervision practices.
<b>Digital Tools, Institutional Support, and Leadership Practices</b>	Sub-Objective 4: To analyze the role of digital tools, institutional support, and leadership practices in facilitating or constraining the effectiveness of digital supervision	Sub-Question 4: How do digital tools, institutional support, and leadership practices facilitate or hinder the effectiveness of digital supervision?	Addresses the enabling or constraining role of digital infrastructure, platforms, policies, and leadership support.
<b>Challenges and Recommendations for Improvement</b>	Sub-Objectives 3 & 5: To examine challenges faced in digital supervision and propose recommendations for enhancing supervision practices	Sub-Questions 3 & 5: What challenges do graduate students encounter in digital supervision, and what recommendations can enhance supervision effectiveness and research skill development?	Generates qualitative insights into obstacles, gaps, and practical strategies for improving digital supervision.

**Significance of the Study**

This study is significant as it addresses a critical gap in the literature concerning the role of digital supervision practices in developing graduate students' research skills. While prior research has extensively explored digital leadership and online learning in higher education

(Cheng et al., 2024; Obied, 2025), few studies have investigated how supervisors' digital practices specifically influence postgraduate research skill acquisition. By focusing on the Faculty of Education – Al-Madinah International University, this study provides context-specific insights into the intersection of digital supervision, institutional support, and students' research competence.

From a theoretical perspective, the study contributes to the emerging discourse on digital academic supervision and transformational digital leadership in higher education. It extends existing models by linking supervision practices with measurable outcomes in students' research skills, such as academic writing, critical thinking, literature synthesis, and research design (Xu & Liu, 2023; Alavi et al., 2025). This linkage enriches the understanding of digitally mediated supervision as not merely a technical function but as a strategic and relational process that fosters students' research development.

Practically, the findings offer actionable recommendations for academic leaders, supervisors, and policymakers. By identifying effective digital supervision practices and highlighting challenges faced by graduate students, the study can guide the design of professional development programs for supervisors, improve institutional digital infrastructure, and inform policies that ensure consistent and high-quality supervision experiences. These contributions are particularly relevant for institutions transitioning to digitally integrated postgraduate supervision systems, offering a model that aligns leadership, digital tools, and student support to enhance research outcomes (Kasim et al., 2023; Lee, 2018).

Finally, the study holds significance for graduate students themselves by emphasizing practices that enhance their research skills, promote timely thesis completion, and increase overall academic satisfaction. By demonstrating the impact of structured digital supervision on research skill development, this research underscores the importance of strategically leveraging digital tools and leadership practices to strengthen the quality of postgraduate education in contemporary higher education contexts.

### **Analytical Framework**

This study is guided by a qualitative conceptual framework that aims to explore how digital supervision practices shape the development of graduate research skills within the Faculty of Education at Al-Madinah International University, Malaysia. Rather than examining causal relationships between variables, the framework provides an interpretive structure for understanding participants' experiences, perceptions, and interactions within digitally mediated supervision contexts.

At the center of the framework are digital supervision practices, which represent the main focus of inquiry. These practices include virtual supervisory meetings, digital feedback, the use of learning management systems (LMS), shared online documents, and digital tools for monitoring research progress. The study explores how these practices are experienced by supervisors and graduate students and how they influence the supervisory process in real academic settings.

Supervisory effectiveness is treated as an explanatory dimension within the framework. It reflects how supervisors provide guidance, feedback, and academic support in digital

environments. The framework assumes that participants' perceptions of effective supervision help explain how digital supervision practices contribute to the development of graduate research skills, without framing this relationship as a measurable causal pathway.

Institutional digital support is included as a contextual condition that shapes the supervision experience. This condition refers to the availability and quality of digital infrastructure, such as internet connectivity, digital platforms, academic databases, and institutional guidelines. The framework recognizes that variations in institutional support influence how digital supervision practices are implemented and experienced by both supervisors and students.

Graduate research skills constitute the central outcome explored in this study. These skills include research planning, literature review, data collection and analysis, academic writing, and problem-solving. From a qualitative perspective, the study seeks to understand how these skills are developed through digitally mediated supervision, as described and interpreted by the participants themselves.

Overall, this conceptual framework provides an interpretive lens for examining digital supervision as a complex educational practice influenced by supervisory behaviors and institutional contexts. It supports the qualitative nature of the study by focusing on meaning, experience, and process rather than on testing predefined variable relationships.

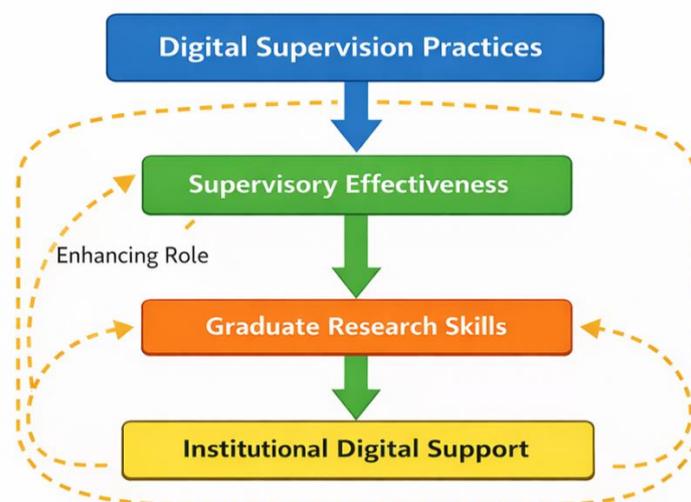


Figure 1: Analytical Framework of Digital Supervision Experiences

This figure shows how digital supervision, supervisory effectiveness, and institutional support interact to shape the development of graduate research skills. It focuses on participants' experiences and the meaning of these interactions rather than on measuring outcomes.

## Theoretical Framework and Literature Review

### *Digital Supervision Practices*

Digital supervision practices involve the structured use of digital tools and platforms to facilitate communication, feedback, and monitoring in postgraduate research. Transformational leadership theory (Bass & Riggio, 2006) provides a theoretical foundation, as leaders' vision, support, and ethical guidance shape how supervisors implement digital tools effectively. Digital supervision enables supervisors to provide timely feedback, maintain

clear records, and support collaborative research activities (Obied, 2025; DOI: 10.1016/j.ssaho.2025.101542).

Empirical studies indicate that online supervision platforms, learning management systems, and shared documents enhance accessibility and clarity of feedback, which contributes to students' research skill development (Kasim et al., 2023; DOI: 10.17576/ajtlhe.1502.2023.02). This aligns with social constructivist theory (Vygotsky, 1978), which emphasizes knowledge co-construction through interactive engagement between supervisors and students.

#### *Leadership Competencies in Digital Contexts*

Leadership competencies, including strategic vision, adaptability, ethical governance, and collaborative orientation, are critical for supporting effective digital supervision. Transformational and technology-integrated leadership models suggest that leaders influence supervisory practices not only through direct guidance but also by creating an environment that encourages adoption of digital tools (Cheng et al., 2024; DOI: 10.5430/ijhe.v13n4p38; Jing et al., 2025; DOI: 10.3390/educsci15050606).

Studies show that supervisors' confidence and effectiveness improve when leadership provides structured training, templates, and guidelines for digital supervision (Obied, 2025). Constructivist supervision theory (Polkinghorne et al., 2023; DOI: 10.3390/encyclopedia3010004) reinforces the notion that competent leadership scaffolds the learning process, ensuring students acquire research skills through iterative feedback and guidance.

#### *Graduate Research Skills Development*

Graduate research skills encompass competencies in literature review, research design, data analysis, and academic writing. Social constructivist theory highlights that these skills are best developed through collaborative and guided interaction with supervisors (Vygotsky, 1978). Digital supervision platforms facilitate this interaction by enabling continuous communication and feedback loops, critical for skill acquisition (Zhu & Engels, 2014; DOI: 10.1177/1741143213499253).

Empirical research indicates that students perceive enhanced skill development when supervision is digitally mediated and structured by competent leadership (Kasim et al., 2023). However, gaps remain in exploring how the combination of digital supervision, leadership competencies, and infrastructure interact to influence skill acquisition in postgraduate students at the Faculty of Education – Al-Madinah International University, Malaysia.

#### *Digital Infrastructure and Resources*

Digital infrastructure, including reliable internet, institutional platforms, and standardized resources, acts as a moderating factor in the effectiveness of digital supervision practices. Contingency and resource-based leadership theories suggest that leadership effectiveness is constrained by environmental resources (Putri & Nugroho, 2024; DOI: 10.1177/00472395231203456).

Studies emphasize that without adequate infrastructure, even skilled leadership cannot fully translate digital supervision strategies into improved student outcomes (Obied, 2025). This

variable is therefore crucial in understanding the practical implementation of digital supervision and its impact on graduate research skills.

### **Gap in the Literature**

Although existing studies highlight the importance of digital supervision, leadership competencies, and infrastructure individually, limited research investigates the integrated effect of these factors on graduate research skill development within the context of the Faculty of Education – Al-Madinah International University, Malaysia. This study addresses this gap using a qualitative approach, capturing the lived experiences of supervisors and students in a digitally supported academic environment.

### **Methodology**

#### *Research Design*

This study adopted a qualitative research design to explore digital supervision practices and their impact on graduate research skills. A qualitative approach was deemed appropriate as it allows for an in-depth understanding of participants' experiences, perceptions, and interpretations within their natural academic context. This design enables the researcher to capture nuanced insights into how digital supervision is enacted and experienced by graduate students, rather than limiting the investigation to measurable variables alone.

#### *Research Approach*

The study employed an interpretive qualitative approach, grounded in social constructivist principles, which emphasize meaning-making through interaction and experience. This approach aligns with the study's aim of understanding how graduate students perceive digital supervision practices and how these practices shape their research skill development.

#### *Research Context*

This study was conducted at the Faculty of Education – Al-Madinah International University, Malaysia, during the November 2025 academic semester. The Faculty provides a digitally mediated postgraduate supervision environment, where digital platforms and communication tools are routinely used to support thesis supervision at both master's and doctoral levels. This context offers an appropriate setting for examining digital supervision practices and their influence on graduate research skill development.

### **Population of the Study**

The population of the study comprised all actively enrolled postgraduate students in the Faculty of Education at Al-Madinah International University, Malaysia, during the November 2025 academic semester. The total population included 241 active master's and doctoral students, representing diverse academic backgrounds and research specializations.

#### *Sample of the Study*

A purposive sampling technique was employed to select participants from the study population. The sample included between 15 and 20 postgraduate students, ultimately comprising 18 master's and doctoral students enrolled in the Faculty of Education at Al-Madinah International University, Malaysia, during the September 2025 academic semester.

Participants were selected based on the following criteria:

1. Active enrollment in a master's or doctoral program.
2. Completion of at least one academic year under digitally mediated supervision.
3. Ongoing engagement in thesis or dissertation research at the time of data collection.

The sample size was guided by the principle of data saturation, whereby data collection continued until no new themes, patterns, or substantive insights emerged from subsequent interviews. Saturation was achieved after the eighteenth interview, indicating that the sample size was sufficient to capture the depth and complexity of participants' experiences with digital supervision practices. This approach is consistent with established qualitative research standards, which emphasize informational richness over numerical representation of the population.

#### *Data Collection Instruments*

The primary instrument was a semi-structured interview guide, developed specifically for postgraduate students. The interview guide focused on:

- Experiences with digital supervision practices.
- Perceived impact of digital supervision on research skill development.
- Challenges and benefits associated with digitally mediated supervision.
- Suggestions for enhancing digital supervision effectiveness.

Each interview lasted approximately 45–60 minutes, allowing for in-depth exploration of participants' experiences. The depth and duration of the interviews contributed to data richness and supported the attainment of data saturation within the selected sample size.

#### *Data Collection Procedures*

Interviews were conducted either face-to-face or via online platforms (Webex), depending on participants' availability. With participants' consent, all sessions were audio-recorded to ensure accuracy and facilitate detailed transcription.

In addition, document analysis of institutional policies, digital supervision guidelines, and available online platforms was conducted to triangulate interview findings and enhance the robustness of the study.

#### *Data Analysis*

All interview recordings were transcribed verbatim and analyzed using thematic analysis (Braun & Clarke, 2006). The analysis followed these steps:

1. Familiarization: Repeated reading of transcripts to immerse in the data.
2. Coding: Systematic coding of statements related to digital supervision, leadership support, and research skill development.
3. Theme Development: Grouping related codes into overarching themes aligned with the conceptual framework.
4. Interpretation: Examining patterns, relationships, and interactions between digital supervision practices and perceived research skill outcomes.

NVivo 12 software was used to organize and code the data, ensuring a structured, transparent, and reproducible analysis process.

### *Trustworthiness and Rigor*

To ensure the credibility, dependability, confirmability, and transferability of the findings, multiple strategies were applied (Lincoln & Guba, 1985):

- **Credibility:** Prolonged engagement with participants and member checking enabled verification of the accuracy of interview data.
- **Dependability:** Detailed documentation of procedures, coding schemes, and theme development ensured transparency and replicability.
- **Confirmability:** Reflexive journaling and peer debriefing minimized researcher bias and grounded interpretations in participants' perspectives.
- **Transferability:** Rich descriptions of the research context, participants, and digital supervision practices allowed readers to evaluate applicability to similar higher education settings.

### **Researcher Reflexivity**

The researcher maintained a reflective journal throughout the study to acknowledge personal biases and assumptions. This facilitated objective interpretation of participants' accounts while recognizing the researcher's influence on data collection and analysis.

### **Ethical Considerations**

Ethical approval was obtained from the Ethics Committee of Al-Madinah International University, Malaysia. Participants were informed about the purpose of the study, assured of voluntary participation, and granted the right to withdraw at any stage. Confidentiality and anonymity were strictly maintained, with personal identifiers removed and data securely stored. All data were used exclusively for research purposes.

### **Limitations**

The study focused on a single faculty within Al-Madinah International University, which may limit the generalizability of the findings. Additionally, reliance on semi-structured interviews may introduce subjectivity; however, this was mitigated through triangulation with document analysis and rigorous thematic analysis.

### **Results and Discussion**

This section presents the findings of the study, integrating them with interpretive discussion supported by verified scholarly research. The data were collected through semi-structured interviews with 18 postgraduate students (master's and doctoral levels) enrolled in the Faculty of Education at Al-Madinah International University, Malaysia. A thematic analysis was conducted, allowing patterns and meanings to emerge inductively from participants' narratives.

The findings are organized around four main themes corresponding to the analytical axes of the study: (1) Strategic Digital Vision, (2) Digital Tools as Enablers, (3) Leadership Competencies and Supervisory Capacity, and (4) Digital Infrastructure as a Moderating Factor. These themes align with the research objectives and highlight how digital supervision practices influence graduate students' research skill development. Illustrative excerpts from participants' responses are included to reflect authentic experiences and provide deeper insights into the dynamics of digital supervision in higher education contexts.

*Theme 1: Strategic Digital Supervision and Communication*

Participants reported that digital supervision practices enhanced communication with supervisors and improved clarity of research expectations. Virtual meetings and continuous electronic dialogue allowed more frequent feedback and collaborative engagement, which students linked to clearer understanding of research requirements and decreased ambiguity in task expectations. These findings echo earlier research that integrating digital tools in postgraduate supervision promotes more dynamic and collaborative relationships between students and supervisors, reshaping traditional supervisory dynamics toward a more participatory model (Maor & Currie, 2017).

Additionally, students perceived that when supervisors initiated digital engagement consistently, the supervision process became more transparent and supportive, enabling them to engage proactively in research tasks. This observation aligns with systematic critiques highlighting the importance of structured digital supervision frameworks that support communication and feedback loops critical for postgraduate student progression.

*Theme 2: Digital Tools as Enablers of Research Skill Development*

Students consistently identified that online tools such as learning management systems, shared cloud documents, and synchronous platforms supported various aspects of their research skill development, including academic writing, literature organization, and methodological planning. One common pattern was the use of shared documents and digital annotation tools to receive iterative feedback, which students reported as directly influencing the refinement of their writing and research structure.

These findings resonate with prior literature showing how intentional use of digital technologies enriches research supervision by facilitating resource access, collaborative drafting, and iterative refinement of research tasks (Maor & Currie, 2017). This effectiveness is echoed in the systematic review of online supervision practices, which highlights digital tools' capacity to support mentoring, communication, and reflective engagement among postgraduate researchers (Kasim et al., 2023).

*Theme 3: Leadership Competencies and Support for Digital Supervision*

Participants highlighted the importance of supervisors' digital competencies and readiness to guide students through digitally mediated interactions. Students reported more positive supervision experiences when supervisors demonstrated flexibility, adapted communication styles to online formats, and actively supported students' digital research workflows.

These observations are supported by literature emphasizing that leadership practices in digital contexts including strategic adaptation and reflective engagement are vital for effective supervision outcomes and the development of research skills. Specifically, systematic evidence on digital leadership underscores that institutions must prioritize digital competencies and leader development to foster environments where technology enhances academic supervision rather than serving merely administrative functions.

*Theme 4: The Contextual Role of Digital Infrastructure*

A recurring theme was the influence of digital infrastructure availability and quality including reliable connectivity, platform access, and institutional support on the smooth

implementation of digital supervision. Participants described instances where technology limitations (e.g., unstable internet) impeded timely feedback and disrupted supervision continuity.

Similar challenges have been highlighted in studies on remote supervision, where infrastructure strongly influences the consistency and depth of digital interactions between supervisors and students. When robust infrastructure was in place, students reported enhanced engagement and reduced cognitive and logistical barriers to research planning and interaction.

#### *Overall Impact on Graduate Research Skills*

Across all themes, participants indicated that digital supervision contributed positively to the development of core research competencies, including critical thinking, academic writing, structuring of literature reviews, and collaborative planning. Students associated frequent, interactive digital feedback with increased confidence in their research abilities and greater independence in managing research tasks.

This supports broader empirical evidence suggesting that well-implemented digital supervision practices particularly those grounded in structured communication, responsive feedback, and collaborative technology use can foster more substantive research skill development among postgraduate students.

#### **Synthesis and Research Implications**

The findings underscore that digital supervision is not inherently effective simply due to technology use. Rather, its impact on research skill development depends on strategic integration, effective leadership competencies, digital tool appropriateness, and sufficient infrastructural support. The qualitative patterns in student narratives indicate that digital supervision can strengthen students' research capabilities when these elements interact synergistically.

This integrated perspective reinforces the notion that postgraduate supervision practices must be designed not only to transfer content or procedural tasks but to actively engage students in reflective and collaborative knowledge construction, which is facilitated by digital technologies when embedded within sound pedagogical and leadership frameworks.

#### **Contribution to the Literature and Research Gap**

One of the key contributions of this study lies in its qualitative focus on graduate students' lived experiences of digital supervision. While much of the existing literature relies on survey-based or institution-level analyses, this study provides in-depth insights into how digital supervision is experienced, negotiated, and interpreted by postgraduate students. By foregrounding students' voices, the study addresses a gap in qualitative evidence concerning the human and relational dimensions of digital supervision in higher education.

Furthermore, the findings extend existing models of digital supervision by highlighting the interdependence between leadership vision, supervisory competencies, and infrastructural conditions. This integrated perspective contributes to a more nuanced understanding of how digital supervision practices influence research skill development beyond technical adoption.

### **Practical and Theoretical Implications**

The findings suggest several implications for policy and practice. Institutions should articulate clear strategic frameworks for digital supervision, supported by professional development programs that enhance supervisors' digital competencies. Additionally, investment in robust digital infrastructure is essential to sustain effective supervision practices.

Theoretically, the study reinforces the relevance of digital leadership theory, TAM, and social constructivist perspectives in explaining digital supervision dynamics. Integrating these frameworks provides a comprehensive lens for understanding how technological, human, and institutional factors interact to shape postgraduate research development.

### **Conclusion and Implications**

This qualitative study set out to explore digital supervision practices and their impact on the development of graduate students' research skills within the Faculty of Education at Al-Madinah International University, Malaysia. By foregrounding postgraduate students' lived experiences, the study addressed a critical gap in the literature that has often treated digital supervision as a technical arrangement rather than a pedagogically and leadership-driven process.

The findings of the study demonstrate that digital supervision is not inherently effective by virtue of technology alone. Instead, its influence on graduate research skill development is contingent upon the presence of a clear strategic digital vision, competent academic leadership, effective supervisory practices, and reliable institutional digital infrastructure. Participants consistently emphasized that meaningful improvement in research skills such as academic writing, critical thinking, literature synthesis, and research design emerged when digital tools were embedded within coherent supervisory frameworks characterized by clarity of expectations, timely feedback, and supportive academic relationships.

The study further reveals that digital supervision practices function as an integrated system rather than isolated practices. Digital tools facilitated communication and monitoring, but their effectiveness was shaped by supervisors' competencies and strongly influenced by the quality of institutional digital support, as reflected in students' experiences. In contexts where supervisors demonstrated adaptability, ethical governance, and collaborative engagement, students reported higher levels of research confidence, autonomy, and skill development. Conversely, weak infrastructure, unclear policies, or limited leadership support constrained the potential benefits of digital supervision, often resulting in fragmented guidance and delayed research progress.

Overall, the study concludes that digital supervision should be understood as a strategic academic practice shaped by leadership, institutional culture, and pedagogical intent. This reconceptualization moves beyond instrumental views of technology and positions digital supervision as a central component of contemporary postgraduate education, particularly within international and digitally mediated university contexts.

### **Theoretical Implications**

From a theoretical perspective, this study contributes to the emerging body of knowledge on digital academic leadership and postgraduate supervision by empirically linking digital

supervision practices to graduate research skill development through a qualitative lens. The findings extend transformational leadership theory and social constructivist supervision models by demonstrating how leadership vision, supervisory effectiveness, and digital environments interact to shape students' research learning experiences.

The study advances existing supervision models by integrating digital supervision as a dynamic, relational process rather than a supplementary mode of interaction. It highlights supervisory effectiveness as a key mediating construct and institutional digital support as a moderating condition, thereby offering a more nuanced conceptual framework for understanding digitally mediated supervision. This integrated perspective enriches theoretical discussions on how leadership and infrastructure jointly influence learning processes in postgraduate research contexts.

### **Practical Implications**

Practically, the findings offer several actionable implications for higher education institutions, academic leaders, and supervisors. First, universities should move beyond ad hoc adoption of digital tools and develop clear institutional policies and guidelines that articulate expectations, roles, and best practices for digital supervision. Such policies can enhance consistency, transparency, and accountability in postgraduate supervision.

Second, academic leaders and supervisors would benefit from targeted professional development programs focused on digital supervision competencies, including effective online feedback, digital communication strategies, and ethical governance in virtual supervision environments. Strengthening these competencies can directly enhance supervisory effectiveness and support students' research skill development.

Third, institutions must invest in robust digital infrastructure, including reliable platforms, access to research databases, and technical support services. The study demonstrates that even highly motivated supervisors and students are constrained when digital resources are inadequate or unstable.

Finally, the study underscores the importance of centering graduate students' experiences in the evaluation and refinement of digital supervision systems. Incorporating student feedback into supervision design can foster more responsive, inclusive, and effective postgraduate research environments.

### **Limitations and Future Research Directions**

While this study provides valuable insights, it is limited by its focus on a single faculty within one university, which may affect the transferability of the findings to other institutional contexts. Additionally, the reliance on qualitative interviews reflects participants' perceptions, which, while rich and meaningful, may not capture all dimensions of supervision effectiveness.

Future research could adopt comparative or mixed-methods designs to examine digital supervision practices across multiple institutions or disciplines. Longitudinal studies may also provide deeper understanding of how digital supervision influences research skill development over time. Further investigation into supervisors' perspectives and institutional

leadership practices would complement student-centered findings and strengthen the evidence base for digitally integrated postgraduate supervision models.

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