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Research article

Determining Students' Acceptance of E-supervision of Research Through UTAUT Model: The Moderating Role of Gender in Nigerian Universities

Determinación de la aceptación estudiantil de la e-supervisión de investigaciones a través del modelo UTAUT: el papel moderador del género en Universidades de Nigeria

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Abstract
Introduction: With the rapid integration of technology in teaching and learning, particularly in online environments, understanding factors influencing its adoption has become crucial. This study explores the moderating effect of gender on students' acceptance of e-supervision of research projects using the Unified Theory of Acceptance and Use of Technology (UTAUT) framework. **Methodology:** A quantitative, cross-sectional survey design was employed. Data

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were collected from university students and analysed using SPSS version 29 and Partial Least Squares Structural Equation Modelling (PLS-SEM). **Results:** The structural model revealed that gender significantly moderated the relationships between performance expectancy, facilitating conditions, and students' acceptance of e-supervision. However, no moderating effect was found between gender and effort expectancy in predicting acceptance. **Discussions:** These findings highlight gender-specific differences in how students perceive the usefulness and enabling conditions of e-supervision platforms, suggesting that male and female students may require different forms of support or motivation. **Conclusions:** As e-learning continues to expand, especially in sub-Saharan Africa, targeted strategies that consider gender differences are essential. This study contributes to the growing literature on digital education by emphasising the nuanced role gender plays in the adoption of e-supervision technologies.

Keywords: UTAUT; e-supervision; research writing; gender; higher education.

Resumen
Introducción: Con la rápida integración de la tecnología en la enseñanza y el aprendizaje, especialmente en entornos en línea, comprender los factores que influyen en su adopción se ha vuelto fundamental. Este estudio explora el efecto moderador del género en la aceptación por parte de los estudiantes de la e-supervisión de proyectos de investigación, utilizando el marco teórico del Modelo Unificado de Aceptación y Uso de la Tecnología (UTAUT). **Metodología:** Se empleó un diseño de encuesta cuantitativa de tipo transversal. Los datos se recopilaron de estudiantes universitarios y se analizaron utilizando SPSS versión 29 y el modelo de ecuaciones estructurales por mínimos cuadrados parciales (PLS-SEM). **Resultados:** El modelo estructural reveló que el género moderó significativamente las relaciones entre la expectativa de rendimiento, las condiciones facilitadoras y la aceptación de la e-supervisión por parte de los estudiantes. Sin embargo, no se encontró un efecto moderador entre el género y la expectativa de esfuerzo en la predicción de la aceptación. **Discusión:** Estos hallazgos destacan diferencias específicas de género en la forma en que los estudiantes perciben la utilidad y las condiciones facilitadoras de las plataformas de e-supervisión, lo que sugiere que los estudiantes hombres y mujeres pueden requerir distintos tipos de apoyo o motivación. **Conclusión**: A medida que el aprendizaje en línea continúa expandiéndose, especialmente en África subsahariana, es esencial implementar estrategias específicas que consideren las diferencias de género. Este estudio contribuye a la creciente literatura sobre educación digital al resaltar el papel matizado que desempeña el género en la adopción de tecnologías de e-supervisión.

Palabras clave: UTAUT; e-supervisión; redacción de investigación; género; educación superior.

1. Introduction

Global technological advancements have orchestrated an indispensable transformation in all spheres of human life, including education. One notable development in higher education institutions worldwide is the paradigm shift in students' research supervision from traditional face-to-face interactions between students and supervisors to virtual ones.

It is, therefore, critical for education stakeholders (lecturers and students) to adapt and keep up with the wind of change as a consequence of the COVID-19 pandemic (R. Astuti et al., 2024; Simmons et al., 2021; Widiyatsih & Setiyo, 2023). This paradigm shift is particularly pertinent in Nigeria, where universities are struggling with the two-pronged pressures of increasing student enrolment and limited faculty resources.

E-supervision, which is also known as electronic supervision (Fasasi et al., 2016), involves using digital platforms such as learning management systems (LMS), emails, and video conferencing to facilitate the supervision process of research projects, dissertations, or theses (Ferreira-Meyers, 2022; Japheth et al., 2023). This approach offers numerous advantages, including flexibility in communication, accessibility, and accommodating diverse schedules. However, its acceptance and adoption by university students remain varied, influenced by several factors, including technological infrastructure, attitude towards technology, and digital literacy.

Nigeria's educational system is in a transitional phase, aiming to integrate more technology into learning. The National Policy on Education emphasises the importance of information and communication technology (ICT) in enhancing educational outcomes (Federal Republic of Nigeria., 2013). Despite these efforts, challenges such as inadequate internet connectivity, limited access to digital devices, and varying levels of ICT proficiency among students and faculty persist (Okoye et al., 2023).

It is also important to reiterate that the critical role of gender in the acceptance and utilisation of e-supervision must be acknowledged (O'Sullivan et al., 2023). In Nigeria, where there is a disparity in access to education and technology among genders, understanding the moderating role of gender in accepting e-supervision is vital. Unlike male students in tertiary institutions, females may experience additional obstacles, including lower self-confidence in using technology, societal expectations, and limited access to digital resources.

The COVID-19 pandemic has further accelerated the need for e-supervision as physical distancing measures necessitated remote learning and supervision (Adewale, 2024; Adewale & Tahir, 2022). This sudden shift highlighted both the potential and the challenges of e-supervision in Nigeria. While some students and supervisors adapted quickly, others struggled with the transition, underscoring the need for a deeper understanding of the factors that influence the acceptance of e-supervision (Awodiji & Ayanwale, 2022).

Given this context, this study seeks to explore the acceptance of e-supervision among university students in Nigeria, with a particular focus on the moderating role of gender. By examining students' attitudes, experiences, and challenges, this research aims to provide insights that can inform policy and practice, ensuring that e-supervision is implemented in a way that is inclusive and supportive of all students. This study will also contribute to the broader discourse on digital education in Nigeria, offering evidence-based recommendations to enhance the effectiveness and accessibility of e-supervision.

Table 1.

Operational Definition of terms

Term	**Operational Definition**
E-supervision	The use of digital platforms (such as LMS, email, video conferencing) for research project supervision.
Performance Expectancy	The degree to which students believe e-supervision will improve their research outcomes.
Effort Expectancy	The perceived ease of using e-supervision tools.
Facilitating Conditions	Availability of technical support, internet access, and institutional resources.

Source: Own elaboration.

1.1. Research Questions

This study sought to answer the following questions:

1. How does performance expectancy influence the acceptance of e-supervision among university students in Nigeria?

2. What is the impact of effort expectancy on the acceptance of e-supervision among university students in Nigeria?

3. What is the effect of facilitating conditions on the acceptance of e-supervision among university students in Nigeria?

4. Does gender moderate the relationship between performance expectancy and the acceptance of e-supervision?

5. Does gender moderate the relationship between effort expectancy and the acceptance of e-supervision?

6. Does gender moderate the relationship between facilitating conditions and the acceptance of e-supervision?

1.2. Literature Review

1.2.1. E-supervision in Higher Education

E-supervision is an area of study with increased interest in higher education (Lubega & Niyitegeka, 2008). The process through which e-supervision proceeds is carried out using different online tools and platforms to facilitate the communication process, feedback, and general guidance process between the supervisor and the student. E-supervision will pave the way for a new reality where supervisory meetings need not be tied down to face-to-face conditions in real-time support and can be sustained, notwithstanding geographical limitations (Taole et al., 2024).

If traditional universities rely more on digital technologies in teaching, e-supervision should also play a part in training researchers and academic knowledge transmission in this era. The concept of e-supervision has evolved with the development of information and communication technologies. Initially, online supervision mainly used e-mail and other relatively primitive digital tools. However, the rapid development of advanced platforms like videoconferencing software, for instance, Zoom or Microsoft Teams, and collaborative software like Google Docs or Mendeley provides ever-growing opportunities for e-supervision (Ferreira-Meyers, 2022). For example, these technologies support flexible, interactive multimedia supervisory sessions that guarantee quality and adequate research supervision. In the case of e-supervision, it is naturally developed by the general digital education trends, where online and hybrid learning became more like a rule than an exception (Sanoto & Sugito, 2021).

The role of e-supervision of students' research in the modern academic environment cannot be overemphasised. It provides flexibility in seeking guidance and support without the pressure of being physically present on campus (Fasasi et al., 2016). This is particularly useful for international part-time students with personal or professional commitments that limit their possibilities for attending in-person meetings (Johnson et al., 2022).

Furthermore, e-supervision of students' research is an inclusive opportunity for diversity in student needs and learning styles, creating a more equitable academic environment. The availability of e-supervision aligns with the increasing global shift towards more inclusive and flexible higher education systems, catering to a widely diversified student population spread over wider geographical areas (Awodiji & Ayanwale, 2022).

On top of enhancing accessibility, e-supervision also offers ways to improve the quality of overall supervision. The use of digital tools facilitates documenting and tracking interactions between the supervisee and supervisor to provide feedback, and a record of the progress made (R. Astuti et al., 2024). This can be a step in the right direction toward making supervisory relationships more organised and productive. Also, e-supervision can allow for more regular and timely feedback, which is all but important since research work is so iterative. Therefore, the system immensely boosts student motivation and keeps them engaged with the constant flow of communication and support, which, on the other hand, gives high completion rates and more effective research outcomes.

1.3. Theoretical Framework and Hypotheses Development

The Unified Theory of Acceptance and Use of Technology (UTAUT) of (Venkatesh et al., 2003) provides a comprehensive framework for understanding the factors that influence university students' acceptance and use of e-supervision. UTAUT identifies four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003; Xue et al., 2024). This means the theoretical framework would only help to generate answers to how these factors, in addition to the moderating effect of gender, influence students' acceptance of e-supervision for research projects. Of all the factors, only performance expectancy, effort expectancy, and facilitating conditions will constitute the exogenous variables, while gender and use acceptance will be the moderator and endogenous variables, respectively.

Performance expectancy is defined as the degree to which an individual believes that performing on e-supervision will result in improved performance regarding the research project (Venkatesh et al., 2003). In this light, performance expectancy relates to whether students perceive e-supervision to be beneficial toward improving the quality of research works, enhancing their understanding, and generally aiming at academic success within the Nigerian university context. Previous studies have reported that performance expectancy predicts technology acceptance significantly (Venkatesh et al., 2003).
We hypothesise that:

- H1: *Performance expectancy positively affects the acceptance of e-supervision by university students in Nigeria.*

Effort expectancy is the ease with which one believes one can use e-supervision. This construct gauges whether students find navigating through and using e-supervision platforms easier. (C. C. Astuti et al., 2023; Terblanche & Kidd, 2022). Effort expectancy is a feature in this aspect, mainly where digital literacy in every individual is not likely to be at the optimum level, meaning that many students may not be confident in using e-supervision tools without struggle or much ado in Nigeria. We hypothesise that:

- H2*: Effort expectancy is positively associated with the acceptance of e-supervision by university students in Nigeria.*

Facilitating conditions refer to the extent to which a student thinks the required technical support exists for effective e-supervision, which would have proper internet connectivity, access to digital gadgets, and institutional backing (Lakhal & Khechine, 2021; Lin, 2019). In the case of Nigeria, where infrastructural challenges arise, facilitating conditions become very critical for e-supervision feasibility and acceptability. Therefore, we hypothesise that:

- H3: *Facilitating conditions positively determine e-supervision acceptance among university students in Nigeria.*

Gender will moderate the influence between the three key constructs and the acceptance of e-supervision in this model (Lin, 2019). Gender, a sociocultural factor that distinguishes differences in opportunity among males and females in access to education and technology, given societal expectations, may likely influence how male and female students perceive and engage in e-supervision in Nigeria. The variety of such research with potential empirical evidence supports that men and women may react differently in performance expectancy, effort expectancy, social influence, and facilitating conditions due to diverse experiences and different confidence levels in operating technology proficiently (Venkatesh et al., 2003).

1.3.1. The Moderating Role of Gender

Gender is posited to moderate the relationships between the four key constructs and the acceptance of e-supervision. In Nigeria, gender disparities in access to education and technology and societal expectations can influence how male and female students perceive and engage with e-supervision (Remi-Aworemi, 2023). Research indicates that men and women may differ in their responses to performance expectancy, effort expectancy, social influence, and facilitating conditions due to varying experiences and confidence levels in using technology (Lin, 2019).

E-supervision, the guidance and mentorship provided to students through digital platforms, has gained prominence in higher education due to its flexibility and accessibility (Linda, 2021). This supervision mode facilitates constant communication, timely feedback, and access to a broader range of resources, which are essential for successful research project management (Selem, 2021). However, despite its numerous benefits, the acceptance and effectiveness of e-supervision can be influenced by various factors, including technological literacy, perceived ease of use, and previous experience with online learning environments (Venkatesh et al., 2003).

One significant factor influencing the acceptance of e-supervision is gender. Research indicates that gender differences exist in adopting and using technology, which can extend to educational technologies (Qazi et al., 2022). Studies have shown that men and women differ in their perceptions of and interactions with technology, often influenced by social and psychological factors (Sun et al., 2020). For instance, men generally exhibit higher levels of confidence in their technical skills and are more likely to explore new technologies independently. In contrast, women may require more support and assurance about the benefits and usability of technology (Reyes et al., 2018).

Empirical evidence supports the moderating role of gender in technology acceptance, particularly in educational settings. For example, a study Al-azawei (2019) found that gender significantly influenced students' acceptance of computer-based assessment, with women showing higher levels of anxiety and lower levels of perceived ease of use compared to men. Similarly, in e-supervision, these gender-based differences may impact how male and female students perceive and engage with digital supervision tools.

Addressing these differences through tailored support and training programs can enhance the overall acceptance and effectiveness of e-supervision, ensuring that both male and female students benefit equally from technological advancements in education.

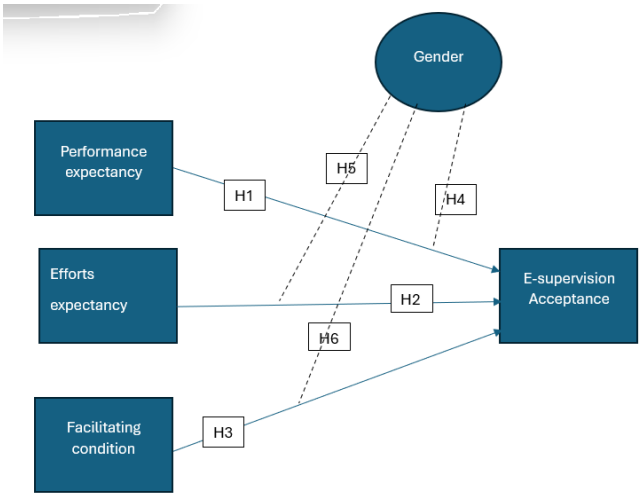
- H4: *Gender moderates the relationship between performance expectancy and the acceptance of e-supervision.*

- H5: *Gender moderates the relationship between effort expectancy and the acceptance of e-supervision.*

- H6: *Gender moderates the relationship between facilitating conditions and the acceptance of e-supervision*

Figure 1.

Conceptual framework



Source: Own elaboration

Figure 1 presents the conceptual framework of the direct and indirect relationship between the independent variables (performance expectancy, effort expectancy, facilitating conditions), moderating variable (gender), and dependent variables (e-supervision acceptance).

2. Methodology

2.1. Research Design

We adopted a quantitative research design of a cross-sectional type in this study. A cross-sectional design is suitable for this study because we elicited data from different universities in Nigeria at a particular time to understand the nature of the relationship between the variables comprehensively.

2.2. Research Context and Participants

This study examined the factors influencing e-supervision acceptance among students at universities in Nigeria. Students from all the faculties of universities in Nigeria were eligible to participate in the study. Participants were randomly selected from a stratified sample of faculties across 10 Nigerian universities.

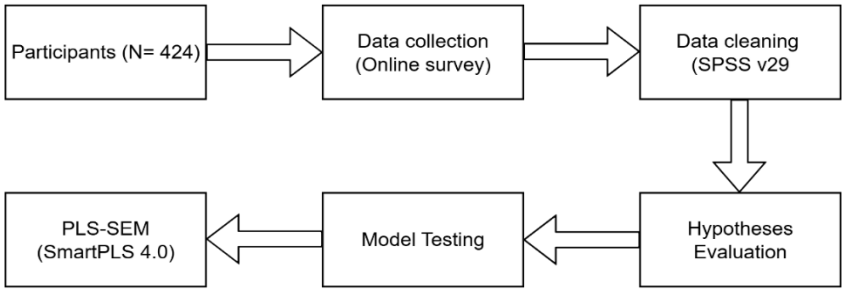
2.3. Data Collection Procedure

The data used in this study was elicited through an online survey shared among university students in Nigeria. The research instrument used in this study was adopted from different studies on technology adoption. After adapting the questionnaire items from various sources (Lakhal & Khechine, 2021; Terblanche & Kidd, 2022; Wut et al., 2022), we designed a Google form to collect data online from the participants.

The instrument was divided into five sections. Section A gathered the socio-demographic information of the participants. Sections B, C, D, and E have items for e-supervision (UTAUT) constructs (Performance Expectancy, Effort Expectancy, Facilitating Conditions) and e-supervision acceptance. The items were rated on 5 Likert scales. Data were collected from March–June 2024 and analysed using SmartPLS 4.0.9.2.

Figure 2.

Flowchart of data collection, cleaning, and analysis procedures



Source: Own elaboration.

2.4. Ethical considerations

We adhered to the best practices in research ethics. All the participants' written informed consent was obtained after the research's approval. The participants were provided with sufficient information on the purpose of the study and the risks involved. They were assured anonymity and that none of their personal and confidential details would be disclosed. This was achieved by deidentifying the instrument used to collect participant data. In addition, we made participation in this study voluntary for the participants, and they enjoyed the freedom to decide when to withdraw their participation.

2.5. Method of Data Analysis

This study used a partial least squares structural equation modelling (PLS-SEM) analytical approach. The beauty of this analytical approach is in its ability to estimate complex models without imposing distributional assumptions on the data (Hair et al., 2019). Data was filtered and cleansed with Statistical Package for Social Sciences (SPSS) IBM version 29.0. SPSS was also used to descriptively analyse the participants' demographic information using frequency count and percentage. Afterwards, the data was imported from the SPSS to SmartPLS software version 4.0.9.2 to analyse this study's measurement and structural models.

3. Results

3.1. Participants' demographic Profile

Table 2.

Participants' Demographic Characteristics

Variable	Category	N	Frequency
Gender	Male	168	39.6%
	Female	256	60.4%
Level	100	79	18.6%
	200	62	14.6%
	300	83	19.6%
	400	160	37.7%
	500	40	9.4%
Faculty	Education	193	45.5%
	Sciences 81	19.1%	
	Social sciences	35	8.3%
	Law	24	5.7%
	Arts	18	4.2%
	Medicine and Health Sciences	10	2.4%
	Management sciences	31	7.3%
	Engineering	32	7.5%
Age Category	Less than 20	84	19.8%
	21-25	194	45.8%
	26-30	50	11.8%
	31 and above	96	22.6%
Total		**424**	**100**

Source: Own elaboration

Table 2 presents the demographic information of the participants in this study. The sample consisted of 168 (39.6%) male students and 256 (60.4%) female students, indicating a higher proportion of females than female participants. furthermore, 79 (18.6%) of the participants were in the 100 level, 62 (14.6%) in the 200 levels, 83 (19.6%) participants in their 300 level, with the majority of the participants, 160 (37.7%) in their 400 level, and 40 (9.4%) in their 500 level.

Furthermore, it was found that the majority of the participants were from the Faculty of Education, with 193 (45.5%). Other faculties that participated included Sciences with 81(19.1%), Social sciences with 35(8.3%) participants, Law with 24(5.7%) participants, Arts with 18 (4.2%), Medicine and Health Sciences with 10 (2.4%), Management Sciences with 31 (7.3%) and Engineering with 32(7.5%) participants. Lastly, the age distribution of the participants revealed that 84 (19.8%) were less than 20 years old, 194 (45.8%) participants were between 21 and 25 years old, 50 (11.8%) participants were between 26 and 30 years old, and 96 (22.6%) were 31 years old and above.

Table 3.

Assessment of Constructs Reliability

Construct	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Acceptance	0.946	0.959	0.823
EE	0.886	0.922	0.747
PE	0.929	0.950	0.825
FC	0.931	0.951	0.826

Source: Own elaboration.

Table 3 presents the reliability and validity components of the constructs in this study, which were evaluated using Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). Table 3 presents the assessment results for each construct: Acceptance, Effort Expectancy (EE), Performance Expectancy (PE), and Facilitating Conditions (FC). The construct of Acceptance demonstrated excellent reliability, with a Cronbach's Alpha of 0.946.

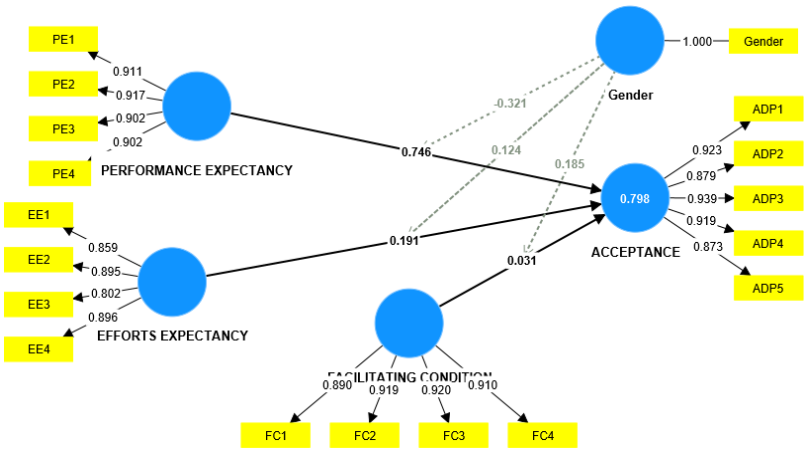
The Composite Reliability for Acceptance was 0.959, indicating a high level of internal consistency. The Average Variance Extracted (AVE) was 0.823, suggesting that the construct captures substantial variance in its indicators, thereby supporting its convergent validity.

Furthermore, the effort expectancy showed strong reliability with a Cronbach's Alpha of 0.886. The Composite Reliability was 0.922, reflecting a high level of internal consistency. The AVE for EE was 0.747, indicating that the construct explains a large portion of the variance, thereby confirming its convergent validity. Similarly, the performance expectancy construct exhibited excellent reliability, with a Cronbach's Alpha 0.929. The Composite Reliability was 0.950, suggesting a very high level of internal consistency. The AVE for PE was 0.825, indicating strong convergent validity as the construct explains a substantial amount of the variance in its indicators.

Lastly, the facilitating condition demonstrated excellent reliability with a Cronbach's Alpha 0.931. The Composite Reliability for FC was 0.951, indicating high internal consistency. The AVE was 0.826, confirming that the construct captures a large proportion of the variance in its indicators, thus supporting its convergent validity.

Figure 2.

Hypothetical Model



Source: Own elaboration.

Table 4.

Convergent Validity

Constructs	Indicators	Outer loading	AVE
Acceptance	ADP1	0.923	0.823
	ADP2	0.879	
	ADP3	0.939	
	ADP4	0.919	
	ADP5	0.873	
Effort Expectancy	EE1	0.859	0.747
	EE2	0.895	
	EE3	0.802	
	EE4	0.896	
Performance Expectancy	PU1	0.911	0.825
	PE2	0.917	
	PE3	0.902	
	PE4	0.902	
Facilitating Condition	FC1	0.890	0.826
	FC2	0.919	
	FC3	0.920	
	FC4	0.910	

Source: Own elaboration.

The convergent validity of the constructs was assessed using the average variance extracted (AVE) and the outer loadings of the indicators. Convergent validity is confirmed when AVE values exceed 0.50 and indicator loadings are above 0.70, indicating that the constructs explain a substantial portion of the variance in their indicators. The Acceptance construct demonstrated high convergent validity with an AVE of 0.823. The outer loadings for its indicators were all significantly high: ADP1 (0.923), ADP2 (0.879), ADP3 (0.939), ADP4 (0.919), and ADP5 (0.873).

These results in Table 4 indicate that the Acceptance construct explains substantial variance in its indicators, confirming its convergent validity. The Effort Expectancy construct also showed strong convergent validity with an AVE of 0.747. The outer loadings for its indicators were EE1 (0.859), EE2 (0.895), EE3 (0.802), and EE4 (0.896). All loadings are well above the 0.70 threshold, supporting the construct's convergent validity.

For Performance Expectancy, the AVE was 0.825, indicating robust convergent validity. The outer loadings for its indicators were PU1 (0.911), PE2 (0.917), PE3 (0.902), and PE4 (0.902). These high loadings confirm that the construct explains a significant portion of the variance in its indicators. The Facilitating Condition construct showed an AVE of 0.826, demonstrating excellent convergent validity. The outer loadings were FC1 (0.890), FC2 (0.919), FC3 (0.920), and FC4 (0.910). These results confirm that the construct effectively captures the variance in its indicators.

3.2. Discriminant Validity

Table 5.

Discriminant Validity (Fornell -Larcker criterion)

Constructs	1	2	3	4	5
Acceptance	0./907				
Gender	-0.125	1.000			
EE	0.808	-0.150	0.864		
PE	0.862	-0.048	0.807	0.908	
FC	0.724	-0.091	0.673	0.728	0.910

Source: Own elaboration.

Table 5 presents discriminant validity using the Fornell-Larcker criterion. The results confirm that each construct meets the required threshold. This presupposes that each construct is conceptually different and measures a unique part of the framework.

Table 6.

Measurement model fit

	Saturated model	Estimated model	Remark
SRMR< 0.08	0.042	0.044	supported
d ULS <HI 95	0.300	0.333	supported
d _G < HI 95	0.340	0.354	supported

Source. Own elaboration

The fits of the measurement model were evaluated using different key indicators, as presented in Table 6. The saturated and estimated models' standardised Root Mean Square (SRMR) were 0.042 and 0.044, respectively. These outcomes are below the threshold of 0.08, which indicates a good model fit. Similarly, the unweighted Least Square Discrepancy (d_ULS) were 0.300 and 0.333 for both saturated and estimated models, while Geodesic Discrepancy (d_G) results were 0.340 and 0.354, respectively. These outcomes are below the threshold of HI 95, suggesting that the model is well-specified and fits the data reasonably.

Table 7.

Collinearity

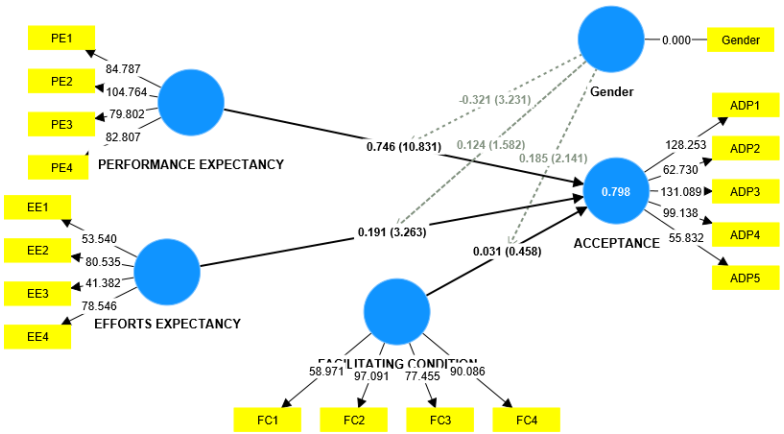
ADP1	4.443
ADP2	3.038
ADP3	5.545
ADP4	4.386
ADP5	2.910
Gender	1.000
EE1	2.288
EE2	2.753
EE3	1.910
EE4	2.859
PE1	3.710
PE2	4.009
PE3	3.324
PE4	3.239
FC1	2.978
FC2	3.855
FC3	3.992
FC4	3.430
Gender X FC	1.00
Gender X PE	1.000
Gender X EE	1.000
Gender X FC	1.000

Source: Own elaboration

The result of the VIF analysis, as presented in Table 7, revealed that the constructs and interaction terms indicated acceptable levels of multicollinearity, with VIF values well below the threshold of 5 (Hair et al., 2022). The only exception is ADP3, which has a VIF value slightly above 5, suggesting potential multicollinearity. However, this is a marginal issue and does not significantly affect the model. These. These outcomes presuppose that the predictors in the model are not unduly influenced by multicollinearity, thereby supporting the robustness and reliability of the structural modelling equation estimates.

Figure 3.

Structural Model Estimate



Source: Own elaboration

Table 8.

Relationship of variables in the model

CONSTRUCT	B	SD	T	P	Remark
EE-> ADP	0.191	0.58	3.263	0.001	Supported
FC-> ADP	0.031	0.068	0.458	0.647	Not Supported
Gender-> ADP	-0.101	0.048	2.112	0.035	Supported
PE-> ADP	0.746	0.069	10.831	0.000	Supported
Gender x EE -> ADP	0.124	0.078	1.582	0.114	Not supported
Gender x FC-> ADP	0.185	0.087	2.141	0.032	Supported
Gender x PE-> ADP	-0.321	0.099	3.231	0.001	Supported

Source: Own elaboration.

H 1: Performance expectancy positively affects the acceptance of e-supervision by university students in Nigeria.

Table 8 revealed that the path coefficient of performance expectancy (B = 0.746, t = 10.831,p = 0.000) has a significant positive causal relationship with the acceptance of e-supervision by university students in Nigeria. This implies that performance expectancy contributed to the acceptance of e-supervision by university students in Nigeria.

Hypothesis 2: Effort expectancy is positively associated with the acceptance of e-supervision by university students in Nigeria.

Table 8 revealed that the path coefficient of effort expectancy (B = 0.191, t= 3.263, p = 0.001) has a significant positive causal relationship with the acceptance of e-supervision by university students in Nigeria. This implies that effort expectancy contributed to the acceptance of e-supervision by university students in Nigeria.

Hypothesis 3: Facilitating conditions positively determine e-supervision acceptance among university students in Nigeria.

Table 8 revealed that the path coefficient of the facilitating conditions (B = 0.031, t = 0.458, p = 0.647) has no significant positive causal relationship with the acceptance of e-supervision by university students in Nigeria. This implies that facilitating conditions did not contribute to the acceptance of e-supervision by university students in Nigeria.

Hypothesis 4: Gender moderates the relationship between performance expectancy and the acceptance of e-supervision.

The interaction term's path coefficient (B = -0.321, t = 1.582, p = 0.114) indicated a statistically non-significant interaction between gender and effort expectancy on acceptance of e-supervision not supporting the hypothesis (H4).

Hypothesis 5: Gender moderates the relationship between effort expectancy and the acceptance of e-supervision.

The interaction term's path coefficient (B = 0.124, t = 3.231, p = 0.001) indicated a statistically significant interaction between gender and performance expectancy on acceptance of e-supervision, supporting the hypothesis (H5).

However, the negative coefficient suggests that the effect of performance expectancy on adoption is weaker for one gender compared to the other.

Hypothesis 6: Gender moderates the relationship between facilitating conditions and the acceptance of e-supervision

The interaction term's path coefficient (B= 0.185, t= 2.141, p = 0.034) indicated a statistically significant interaction between gender and facilitating condition on acceptance of e-supervision, supporting the hypothesis (H6). This result of the interaction effect implies that the impact of facilitating conditions on the acceptance of e-supervision varies depending on gender. For instance, the facilitating conditions like availability of resources, technical support, and ease of use might have a more substantial influence on the acceptance of e-supervision for one gender compared to the other. This understanding can help the university management to organise e-supervision strategies that will be more effective by considering gender differences and ensuring that the facilitating conditions are inclusive.

3.3. Coefficient Determination (R2) and Predictive Relevance (Q2)

Assessment of Coefficient Determination (R^2) and Predictive Relevance (Q^2) is another important part of structural model evaluation (Eleyan, 2022). While the coefficient of determination (R^2) is 0.798.

The Q^2 = 0.647 in Table 9 indicates the predictive relevance of the model. A Q^2 value greater than 0 suggests that the model has moderate predictive relevance, but 0.647 is mild in this case. This implies that the model explains only about 64.7% of the variance in the endogenous variable "acceptance of e-supervision", not captured by the error term. Similarly,

Table 9.

Assessment of Coefficient Determination (R^2) and Predictive Relevance (Q^2)

Endogenous	SSO	SSE	Q^2 (=1-SSE/SSO)
Acceptance of e-supervision	2,120.00	747.427	0.647

Note: SSO= total sum of squares; SSE= sum of squares due to error

Source. Own elaboration.

3.4. Effect size f^2

Table 10.

The effect size of exogenous constructs

Exogenous Construct	f^2	Effect Size
Effort Expectancy	0.019	small effect
Performance Expectancy	0.250	large effect
Facilitating Condition	0.001	very small effect

Source: Own elaboration.

The effect size f^2 is used to estimate the effect of specific exogenous constructs that contribute to endogenous constructs using the change if deleted from the structural model. According to Cohen (1988), an f^2 value of 0.02 represents a small effect, 0.15 a medium effect, and 0.35 a large effect.

Table 9 shows that Performance Expectancy has the most substantial impact on the Hairdependent variable, with a medium to large effect size ($f^2 = 0.250$). In contrast, Effort Expectancy has a small effect size ($f^2 = 0.019$), and Facilitating Condition has a negligible effect size ($f^2 = 0.001$), indicating minimal to no practical significance in the model. These findings highlight the varying degrees of influence each exogenous construct exerts on the dependent variable (Cohen, 1988). The constructs did not significantly explain the variance in the endogenous variable, suggesting that other factors might be more important in influencing the endogenous.

4. Discusión

This study investigated the factors that influence the acceptance of e-supervision among university students, with particular attention to performance expectancy, effort expectancy, facilitating conditions, and the moderating role of students' gender, using the UTAUT framework. Of the three direct factors tested, only facilitating conditions did not have a direct causal relationship with students' acceptance of e-supervision.

It was found that performance expectancy significantly contributed to the acceptance of e-supervision by university students in Nigeria. In other words, students' acceptance of e-supervision is influenced by their perception that the platform will help them conveniently achieve their research goals.

This finding aligns with Terblanche and Kidd (2022), who showed that performance expectancy influenced students' adoption of chatbot services to resolve academic queries. Similarly, Elshaer and Hasanein (2024) confirmed that performance expectancy affected students' behavioural intention to use artificial intelligence for learning-related activities.

Effort expectancy also contributed to students' acceptance of e-supervision. When the technology used for e-supervision is user-friendly, features a simple interface, and provides readily available technical support and clear instructions, students are more willing to adopt it.

This outcome agrees with Al-azawei (2019), who noted that students are unlikely to use web-based learning platforms that require high levels of effort. Additionally, Hunde et al. (2023) reported that effort expectancy positively influences students' behavioural intention to use e-learning. Likewise, Elshaer and Hasanein (2024) also found that effort expectancy affects students' intention to adopt AI for educational purposes.

Conversely, this study did not find a significant direct relationship between facilitating conditions and the acceptance of e-supervision. One possible reason for this is the general access that students in Nigerian universities already have to mobile learning devices and basic digital infrastructure required for e-supervision.

This outcome resonates with the findings of Al-Adwan et al. (2018), who identified mobile learning devices as essential facilitators of e-supervision. It also aligns with Wut et al. (2022), who found a non-significant positive relationship between facilitating conditions (e.g., computing equipment, fast-speed internet, user-friendly platforms) and students' intention to engage in online learning platforms.

The study also revealed a statistically nonsignificant correlation between gender and effort expectancy in the acceptance of e-supervision. This contradicts the findings of Al-azawei (2019), who found that gender influenced the adoption of learning management systems in higher education.

However, the result aligns with Kanwal et al. (2020), who reported that students' gender did not significantly influence the relationship between perceived ease of use and behavioural intention to adopt e-learning.

The outcome further indicated a significant interaction between gender and performance expectancy in the acceptance of e-supervision. This suggests that gender plays a moderating role in how students perceive the usefulness of e-supervision tools.

Kanwal et al. (2020) also found that gender moderated the relationship between the perceived usefulness of computer self-efficacy and students' behavioural intention to adopt e-learning, which supports the present findings.

Finally, the study found a statistically significant interaction between gender and facilitating conditions in the acceptance of e-supervision. This implies that students' gender can influence how they respond to available facilitating conditions for e-supervision. In other words, being male or female may affect their disposition toward e-supervision, depending on the availability of supportive infrastructure.

5. Conclusiones

E-supervision is increasingly being adopted in many higher institutions worldwide as one of the gains of COVID-19 imposed online learning component. Educational stakeholders (school management and project supervisors) need a robust understanding and detailed information about the behavioural intention of their potential e-supervisees in higher institutions. Previous researchers have given some insight into students' behavioural intentions to online learning. This study has mainly been able to provide an evidence-based understanding of the mediating role of students' gender in the acceptance of e-supervision of research projects, which is a requirement that must be fulfilled before graduation.

5.1. Implications for Theory and Practice

This study's findings have theoretical and practical implications for higher education, particularly in the e-supervision of students' research projects. It has contributed to understanding technology acceptance in higher education by extending the Unified Theory and Use of Technology (UTAUT) framework to the domain of e-supervision among university students in Nigeria. The outcomes confirm the relevance of performance and effort expectancy as critical determinants of e-supervision acceptance, aligning with existing literature on technology adoption.

Higher institutions need to amplify the benefits of e-supervision in helping students achieve their academic goals. This can be realised through demonstrations, testimonials, and case studies highlighting the effectiveness of e-supervision in facilitating research and academic success. By clearly communicating the advantages, institutions can enhance students' performance expectancy, increasing their acceptance of e-supervision.

Even though facilitating conditions did not directly influence acceptance, ensuring that students have more access to the necessary resources needed to triumph.

These facilities include good internet connectivity, adequate computing equipment, and user-friendly platforms to support e-supervision. Meanwhile, management should adopt a gender-sensitive approach by tailoring communication and support materials to address the specific needs and preferences of different genders to enhance the perceived usefulness of e-supervision. Above all, the management authorities of higher institutions should consider these findings when designing and implementing e-supervision policies. This should include periodical training for both students and supervisors to bridge gaps in the use of technology for that purpose.

5.2. Limitations and Further Research

This study used a self-report cross-sectional survey, which has the possibility of response bias, to collect data. Hence, a longitudinal approach can be adopted in subsequent studies to explore the relationship and understanding of the moderating role of gender. The second limitation is the inability to account for other variables that can influence the adoption of e-supervision. Further studies could adopt other variables to explore the behavioural intention of the students towards e-supervision in their research projects. Above all, a mixed study research design can also be adopted to better understand the e-supervision of students' research projects in Nigerian higher education institutions.

5.3. Future Lines

1) Longitudinal studies to track gender dynamics in e-supervision adoption.

2) Interventions to address gender-specific barriers (e.g., digital literacy workshops for female students).

3) Replication in other Sub-Saharan African contexts to validate findings.

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