

PREDICTORS POSTGRADUATE RESEARCH QUALITY: STUDENTS PERCEPTIONS

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ABSTRACT: Research constitutes a fundamental mandate of higher education institutions, shaping both service delivery and broader societal contributions. Through applied research, universities identify the essential skills, technologies, and knowledge required by employers, thereby facilitating the development of academic programs that align with labor market demands. Despite its centrality, limited understanding exists regarding the key factors that influence the quality of postgraduate research. Guided by the education production function framework, this study examined the determinants and benchmarks of postgraduate research quality. A cross-sectional survey design was employed, involving 236 postgraduate students (126 males and 110 females). Data were analyzed using Structural Equation Modelling (SEM). The findings indicate that students' perceptions of their supervisors' competence significantly and positively influence both thesis performance and satisfaction with thesis quality. Additionally, performance in the Advanced Research Methods course significantly predicts thesis performance but does not affect satisfaction levels. Furthermore, access to research facilities does not significantly impact thesis performance but positively influences perceived thesis quality. The study concludes that effective supervision is critical to both objective and perceived research success, while the role of research methods training in shaping satisfaction is complex. Moreover, research infrastructure appears to affect students' subjective assessments of thesis quality more than their actual performance. Based on these findings, the study recommends that universities invest in supervisor training and mentoring programs, and revise research methods curricula to better address the practical challenges faced by students.

KEYWORDS: Postgraduate research, Research quality, Higher education research, Research output.



INTRODUCTION

Universities worldwide are mandated to fulfill three interrelated functions: teaching, research, and community service. Among these, research plays a pivotal role by generating new knowledge, informing pedagogical practices, and enhancing community engagement (Altbach, Reisberg, & Rumbley, 2009). In the academic sphere, research underpins curriculum development, fosters pedagogical innovation, and aligns academic programs with the evolving demands of the labor market (Tight, 2016). Beyond the classroom, universities contribute to national development through applied and policy-relevant research. In Ghana, for instance, academic staff frequently engage with local communities through district assemblies, advisory committees, and community-based research addressing critical issues such as disease prevention, poverty alleviation, and educational access (Amoako & Essel, 2013; Tertiary Education Policy, Ghana, 2014).

Given its centrality to knowledge production and socio-economic transformation, research is prioritized within higher education institutions. Faculty members are expected to engage in scholarly inquiry as a core responsibility, with research outputs often serving as benchmarks for career advancement and institutional reputation (Owusu-Mensah, 2015; TEU, 2020). Postgraduate programs, particularly those with a research-intensive focus, depend heavily on the quality of supervision, student competence, and institutional support for their success (Mahmood, 2011; Akotia & Anum, 2021). In this context, research quality has emerged as a critical concern for scholars, policymakers, and university administrators. However, dominant approaches to assessing research quality have been critiqued for emphasizing quantitative metrics such as publication counts and project completions while neglecting intellectual rigor, relevance, and societal impact (Bakioglu & Kurnaz, 2009; Charmaz & Thornberg, 2021).

The debate on what constitutes research quality remains active. Mahmood (2011) frames quality in terms of methodological rigor, timeliness, and analytical validity, while Stenbacka (2001) and Besley (2009) emphasize originality, clarity, significance, and practical relevance. Besley, in particular, advocates for a contextualized understanding of research quality that considers epistemological, technological, and institutional developments, cautioning against uniform evaluation metrics. Scholars in qualitative research (Jaroonkhongdach et al., 2014; Charmaz & Thornberg, 2021) further argue for frameworks that value interpretive depth and the multiplicity of meanings inherent in human experience, challenging simplistic notions of reliability and validity.

In the Ghanaian context, concerns over the quality of postgraduate research are increasingly pressing. Persistent challenges such as limited funding, inadequate supervision, restricted access to scholarly resources, and weak institutional research cultures have been documented (Atuahene, 2015; Osei, 2020; TEU, 2020). These issues are compounded by supervisory overload, insufficient mentorship structures, and inconsistent enforcement of research ethics and academic standards (Asare & Daniel, 2022). As postgraduate enrolment increases driven by national development goals and the imperative to build local research capacity, concerns continue to grow about the quality and impact of research outputs and the preparedness of graduates to contribute meaningfully to national and global scholarship (GTEC, 2022).



Ghana's national policy documents, such as the Education Strategic Plan (2018–2030) and the National Research Agenda, emphasize strengthening research and innovation systems as vital to sustainable development. These priorities align with the broader Coordinated Programme of Economic and Social Development Policies (2017–2024), which positions research as a key driver of socio-economic advancement. However, the successful realization of these ambitions depends on the quality of postgraduate research and the institutional frameworks that support it. Without a comprehensive understanding of the determinants of research quality, efforts to improve research outcomes risk remaining fragmented and ineffective.

Despite an expanding discourse on research quality, empirical studies examining the drivers of postgraduate research quality from students' perspectives in Ghana remain scarce. While some investigations have addressed broader challenges in postgraduate education (Atuahene & Owusu-Ansah, 2013; Amponsah, 2021), and others have explored general quality assurance in university service delivery (Yidana et al., 2023), few have employed robust analytical frameworks to capture the complex interplay between individual competencies, supervisory practices, and institutional resources in shaping research quality.

Thus, a critical gap exists in understanding the multidimensional factors influencing the quality of postgraduate research in Ghanaian universities. Addressing this gap is essential, as improvements in postgraduate research quality directly support national development goals, institutional competitiveness, and the overall strength of Ghana's research ecosystem. Without empirical insights into how supervisory expertise, student research skills, access to research resources, institutional support, and research culture interact, policy initiatives and institutional reforms may fail to yield meaningful improvements.

Purpose of the Study

The purpose of this study was to examine the key factors that influence the quality of postgraduate research, with a specific focus on the roles of supervisory competence, student research competence, research methods training, and access to institutional research resources within Ghanaian universities.

REVIEW OF RELATED LITERATURE

Theoretical framework of the Study

The study was based on the Total Quality Management Theory, also known as TQM. This theory focuses on continuous improvement and the satisfaction of stakeholders. It emphasizes quality management at every stage, from planning to execution, with constant evaluation and feedback to drive improvements (Deming, 1986; Juran & Godfrey, 1998). The main goal of TQM is to ensure that quality is integrated into every aspect of the organization leading to better results and satisfaction for both customers and employees.

The theory is applied in this study to help us understand how universities create an environment that supports high-quality research and how quality is integrated into every aspect of postgraduate research. This involves a culture of ongoing improvement, regular feedback, and strong mentorship. Universities can improve research quality by implementing effective supervision, carefully managing resources, and providing strong institutional support.



Enhancing research quality means setting up regular feedback loops, conducting evaluations, and systematically developing students' research skills in an organized manner. Key areas where this theory is applied include ensuring effective supervision, providing high-quality resources, having supportive institutional policies, and ensuring supervisors have the necessary knowledge, experience, and skills to guide research.

Empirical review

Determinants of quality research output

Research conducted in higher education institutions has often focused on identifying the factors that contribute to producing high-quality research, particularly among faculty members. A significant body of literature highlights that a researcher's skills and abilities are critical determinants of research quality. These competencies, often developed through formal and informal training, substantially enhance research output. Brown, Wolski, and Richardson (2015) emphasize that while formal training is essential for researchers transitioning into new roles, informal avenues such as mentorship and professional networks are equally important for sustaining and improving research capacity.

Studies specifically focusing on postgraduate research further underline the importance of skills development. Igbokwe (2019), for instance, found that librarians' research competencies, editors' expertise, and strong mentoring relationships were vital contributors to research quality. Similarly, Muthiani et al. (2022) identified several skill areas crucial for the quality and timeliness of postgraduate research, including the selection of research topics, formulation of research questions, identification of gaps, appropriate research design, development of research tools, and effective data analysis. Access to skill-enhancing workshops and structured training opportunities has been shown to significantly improve research quality, reinforcing Brown et al.'s (2015) assertion that both formal instruction and informal support systems are critical for researchers' growth.

Beyond individual skills, the quality of research supervision plays a pivotal role in shaping postgraduate research outcomes. Effective supervisors not only guide students through the technical aspects of research but also provide emotional support and foster independent thinking. Lee (2008) highlights that supervision transcends academic instruction, requiring a relational dynamic that encourages intellectual autonomy. Brew's (2001) findings further illustrate that active, timely feedback and consistent academic support from supervisors lead to higher research quality by providing clarity of purpose and boosting students' motivation. In addition, Wadesango (2014) stresses that mentoring in research settings helps new researchers manage time effectively, facilitating the achievement of research milestones and deadlines.

Access to adequate research facilities and tools constitutes another major determinant of research quality. In disciplines such as science, engineering, and medicine, specialized equipment and modern laboratories are indispensable. Baird (2004) demonstrates that well-maintained, readily accessible equipment enhances the accuracy of experiments and overall research quality in the natural sciences. Similarly, Seymour et al. (2004) show that access to cutting-edge technology significantly boosts students' research productivity and outcomes. These findings suggest that institutional investment in research infrastructure is a critical enabler of high-quality research, particularly at the postgraduate level.



Institutional and external factors also significantly affect the quality of research output. Several studies (e.g., De Zoysa, 2007; Grant, 2005; Meerah, 2010; Wareing, 2009) have identified financial support, organizational policies, logistical arrangements, and personal circumstances as influential variables. Okoduwa et al. (2018) highlight challenges such as insufficient mentoring time, limited funding and research facilities, and logistical barriers as major impediments to postgraduate research quality. Vaschetto (2011), referencing Wright, emphasizes the influence of institutional policies on research productivity. However, many of these studies do not clearly prioritize the relative importance of these factors or directly relate them to postgraduate research performance. Addressing this gap, Hai and Muhammad (2019) found that personal, institutional, and supervisor-related elements all positively impact postgraduate research performance, with personal attributes such as motivation and perseverance emerging as the most significant predictors.

Despite the wealth of literature, limited research has explored these determinants within the context of Sub-Saharan Africa, particularly in Ghanaian higher education institutions. Therefore, the present study aims to examine the predictors of quality postgraduate research in Ghana, focusing on key elements such as research supervisors' expertise, students' advanced research skills, access to quality research articles and facilities, and the amount of time devoted to self-directed research. Anchoring this investigation within the education production function framework, the study seeks to contribute to a more contextualized understanding of how various individual, supervisory, and institutional factors interact to influence postgraduate research quality in Ghana.

Conceptual framework and hypotheses

A review of literature related to the subject matter under discussion has revealed a number of factors that determine research quality. Based on this, a conceptual framework is built narrowing it to postgraduate research. Thus elements in this conceptual model include knowledge and skills of the research supervisor, knowledge and skills of the postgraduate student in advance research, access to quality research papers, time allotted to self-directed research activities, availability of resources and research culture of the postgraduate and final research thesis score. The framework is represented in figure 1.



Figure 1. Conceptual framework of postgraduate research quality



Relationship between supervisor competence and students' performance in thesis: The main role played by a research supervisor is providing guidance and coaching to postgraduate candidates while they undertake their research projects. Therefore, the knowledge and skills of a research supervisor is fundamental when it comes to quality postgraduate research. To be an effective supervisor one must not only have the necessary skills and knowledge must also have the wealth of experience to share with the research candidates. A supervisor must himself understand the research processes. Postgraduate research entails informal communication usually face-to-face and during a sustained period of time between a person who is perceived to have greater relevant knowledge, wisdom, or experience (the mentor) and person who is perceived to have less (the mentee) (Ekechukwu & Horsfall, 2015). Research supervisors' quality therefore influences the quality of postgraduate research. Available research evidence (Igbokwe, 2019; Muthiani, et al, 2022) points to a positive relationship between the knowledge, experience and competencies of a research supervisor or mentor on hand and quality research output on the other. Thus, the study hypothesises that:

 $H_{1:}$ Research supervisors' competence significantly and positively predicts postgraduate research output.

Relationship between students' performance Advance Research Methods and their *performance in thesis evaluations*: Postgraduate students are also required to have some requisite knowledge and expertise in advance research methods to quality for postgraduate research. In some universities, advance research methods form part of the course work which all graduate students must register and study. The course is expected to help research candidates to acquire knowledge, skills and competencies in both qualitative and quantitative research methods. Research shows that prior research skills and competencies of postgraduate students positively impact the quality of their research output. Muthiani, et al (2022) examined the extent to which research skills determine completion time among regular postgraduate students in the School of Education, Kenyatta University (KU). They found that research skills such as skills in topic identification; statement of the problem; criticizing, identifying research gaps and connecting reviewed literature with the current study; choosing research design; making appropriate research tools; and establishing appropriate data analysis methods determine the quality and completion time for postgraduate research. Therefore, the study hypothesises that:

H₂: Performance of students in Advanced Research Methods Course significantly predict postgraduate research quality?

Relationship between the availability of research facilities and students' performance in thesis evaluations: Availability of resources to support postgraduate research is yet another factor that determines postgraduate research quality. Facilities such as serene classrooms, internet infrastructure, ICT centres quality laboratories and libraries are fundamental to the delivery of quality research output. These facilities aid students in their various research activities in areas including accessibility of journal articles, laboratory practical, research data analysis just to mention a few. A study by Savasci and Tomul (2013) concludes that learning facilities of institutions play a key role in students' performance. Ali et al (2013) further found that students in resource-rich schools tended to perform better. MacKeracher et al. (2006) suggest that lack of resources could potentially hamper students' academic performance. We hypothesise that:

H₃: Academic facilities/infrastructure significantly predict postgraduate research output



Relationship between time allocated to research activities and students' performance in thesis evaluations. Time allocation and utilisation is an important variable that has been found to predict the academic performance of students. Most studies on the effect of time allocation on the academic achievement of students have focused on undergraduate students. Bratti and Staffolani (2013) investigated time allocation and educational production functions using a theoretical model in which students decide the optimal allocation of their time between lecture attendance, self-study and leisure. They found a positive causal relationship between these two time-used variables and academic achievement of students. Grave (2010) investigated the effect of students' time allocation on the average grade of undergraduate students by gender and field of study. They found that time spent on class attendance was positively related with grades for female and higher ability students. Our approach in this study is different. In this study we sought to determine how time spent on self-directed research related activities, time spent with supervisors and colleagues and spent attending seminars predict quality research output of postgraduate students. Therefore, we hypothesised that:

H₄: Time allocation positively predicts quality research output of postgraduate students

Relationship between research culture and students' performance in research thesis evaluations: Research culture encompasses the behaviours, values, expectations, attitudes and norms of our research communities. It influences researchers' career paths and determines the way that research is conducted and communicated. Research cultures are built on the values, expectations and behaviours that shape how we support, deliver and communicate our research. Research cultures are built and maintained by the actions, interactions, behaviours and processes that we all encounter and perform while undertaking or supporting research. Research culture of Postgraduate Students also has an impact on the quality of their research output. In this study we sought to determine how various cultural activities such as a good range of seminars in a research area, opportunities to discuss my research with other researchers including research students and the research community influence the quality of postgraduate research output. Thus we hypothesised that:

H_{5:} Research culture significantly predicts postgraduate research output quality

RESEARCH METHOD

Research design

The study made use of the cross-sectional survey design to collect the data since the aim was to determine the causal relationship between the factors that hypothetically predict post graduate research quality. The design was judged to be appropriate because according to Cohen, Manion and Morrison (2007) such designs look at individuals, groups, institutions, methods and materials in order to describe, compare, contrast, classify, analyse and interpret the entities and the events. The researcher was only interested in determining the factors that predict postgraduate research quality. That is to say that in using the cross-sectional research design, the interest of the researcher was not to manipulate the variables but just determine and describe the relationship that exists among them.



Population, sample and data collection

The population for the study was all final year postgraduate research students in the 3 public universities in Northern Ghana during the 2023/2024 academic year. The population was estimated at 1,322. This population was targeted for the study because the students had been in the universities for at least 2 years and had already finished their research work, thus accumulating enough postgraduate research experience. Thus, they stood a better chance of giving valid perception of what predicts the quality of their research output. To guarantee that each student had an equal chance of being chosen for the research, probability sampling procedures namely, the stratified and simple random sampling techniques were employed in sampling the students. In all, a total of 236 students made up of 126 males and 110 female students from 3 public universities were sampled to take part in the study. The sample size was determined using the standard sample size calculation formula.

Instrument

The researcher employed a questionnaire to collect the data. To provide a simple and rapid answer to the questionnaire items, each section's items were composed entirely of closed-ended statements using the Likert Scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) formats. The instrument was developed based on the recommendation of Churchill's (1979). The first step as recommended by the author was a review of literature. Literature related to previous models of postgraduate research output was reviewed and questionnaire items covering the various domains of quality research were developed. Further, focus group discussions were held with students to solicit from them their expectations or views of quality postgraduate research output. A 35-item questionnaire which incorporated the output of literature review, focus-group discussions was then developed.

The next step was expert validation of the instrument. Four experts in the field of quality assurance at the C. K. Tedam University of Technology and Applied Sciences were contacted to go through and validate the instrument. Each of these experts worked independently after which the four came together to discuss and finalize the instrument. 5 questionnaire items were removed because they were either ambiguous or duplication of others. Items that were not clear were also reworded. The final set of questionnaire items after this stage was 30-item questionnaire. The questionnaire consisted of six sections. Section A dealt with students' demographic details such as age religious affiliation and gender. The rest of the sections dealt with the predictors of postgraduate research quality and students level of satisfaction with the postgraduate research processes

Pilot testing

A total of 161 students were used in the pilot testing of the instrument. The Sample was taken from a private university in the Northern Region of Ghana. The students were final-year postgraduate students who had finished their thesis defence and were awaiting graduation. The sample averaged 24.0 years of age and had a standard deviation of 0.50 years. The pilot test's objective was to establish if the questionnaire's items accurately represented the constructs they were supposed to measure. To this end, exploratory factor analysis was carried out on the perception-based factors including, research supervisors' experience and competence, availability of research infrastructure, time allocated to research-related activities, students'



level of satisfaction with the output of their own research and, research culture. Validity and, reliability tests were done on the data set to determine their suitability for further analysis.

Factor analysis

The purpose of the factor analysis was to reduce the large number of variables that describe students' perceptions of quality research inputs and processes which give rise to quality research output to a few interpretable latent factors (Hair et al., 2010). In other words, the researcher sought to find a smaller number of interpretable factors that explain the maximum amount of variability in the data.

The exploratory factor analysis involved two steps. The first step was to determine the factorability of the data set using four key indices namely, the Determinant, the Kaiser-Meyer-Olkin (KMO), Bartlett's test of sphericity and, the Bivariate normality of the data set. The determinant of the correlation or covariance matrix is an important measure that provides insight into the relationships between the variables being analysed. Specifically, it helps to determine the multicollinearity or singularity of the data ((Fabrigar et al., 1999; Field, 2013). A very small determinant (close to zero) indicates that the variables are highly correlated with each other. This suggests the presence of multicollinearity, which can be problematic in factor analysis because it means the variables do not provide enough unique information, and some may be redundant (Tabachnick & Fidell, 2013).

The Kaiser-Meyer-Olkin (KMO) measure helps determine how much of the variance in each variable is shared with others, essentially assessing the strength of their relationships. A high KMO value indicates that factor analysis is appropriate, as it suggests sufficient correlation between the variables and the underlying factors. Conversely, a low KMO value suggests that factor analysis may not be suitable for the dataset, as the variables may not exhibit enough shared variance (Hair et al., 2010). The more suitable the data is for factor analysis, the smaller the percentage. KMO numbers between 0.8 and 1 denote sufficient sampling.

Bartlett's Test of Sphericity is a statistical test used in factor analysis to check if the correlation matrix of the variables is different from an identity matrix. Basically, it helps determine if the variables are correlated enough to move forward with factor analysis (Bartlett, 1954). When the test results show a significant value, typically p < 0.05, it indicates that the correlation matrix is not an identity matrix (Hair et al., 2010). This suggests that there are meaningful relationships between the variables. In other words, the data exhibits an underlying structure that can be effectively explored through factor analysis, supporting the use of factor extraction.

The bivariate normality assumption implies that the variables in the analysis are expected to follow a multivariate normal distribution. In other words, this suggests that the relationship between any two variables should be normally distributed. This assumption is critical because the statistical technique used in the exploratory factor analysis (maximum likelihood estimation) rely on normality to provide reliable and accurate results (Tabachnick & Fidell, 2013; Field, 2013). For each set of variables, the data should follow a bivariate normal distribution, and the observations must be independent. Normal Q-Q plots were used to assess the normality of the data set. The normal Q-Q plots for all variables showed that the distributions of the scores were close to the straight line, indicating that the data approximated normality. According to the central limit theorem, the distribution of sample means will tend to be approximately normal if a researcher has a population with a known mean and standard



deviation and draws sufficiently large random samples with replacement. With the use of random sampling, a sample size of 161 was considered large enough to satisfy this condition.

The next stage in the exploratory factor analysis was the extraction of the number latent variables. The extraction method that was used to extract the factors was the Principal Axis Factoring (PAF). Principal Axis Factoring (PAF) is an extraction method used in exploratory factor analysis (EFA) that helps identify the underlying factors responsible for the observed correlations among variables. The research assumed that the data contained a smaller number of underlying factors that cause the correlations between variables. Thus the focus of the researcher was to determine the common variance, which is the variance that is shared between variables. It was further to identify latent variables or constructs that underlie the observed variables (items) that explain the input, and process factors responsible for postgraduate research quality. With the aid of a scree plot, the analysis yielded five (5) latent variables/factors.

RESULTS AND DISCUSSION

Results of exploratory factor analysis

Suitability of Data for EFA (Factorability of Data): The data were initially screened for univariate outliers, and no extreme outliers were identified. To assess the suitability of the data for factor analysis, several tests were conducted: the determinant of the correlation matrix, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, and Bartlett's test of sphericity. The determinant of the correlation matrix was found to be 7.248E-8, which is higher than the commonly accepted threshold of 0.0001 (Field, 2018), indicating low multicollinearity among the variables.

The KMO measure was 0.715, which exceeds the recommended threshold of 0.6 (Tabachnick & Fidell, 2013), suggesting that the correlations between the variables were sufficient for factor analysis. Bartlett's test of sphericity yielded a significant result (χ^2 (666) = 7301.840, p < 0.001), confirming that the correlation matrix differed significantly from the identity matrix, further supporting the appropriateness of factor analysis.

Additionally, the diagonals of the anti-image correlation matrix were all greater than 0.5, indicating that each item in the constructs shared some common variance (Tabachnick & Fidell, 2013). The communalities for all items were greater than 0.5, further confirming the suitability of the data for exploratory factor analysis.

A test for bivariate normality was conducted using normal Q-Q plots generated with SPSS software (version 20). The normal Q-Q plots for all variables indicate that the distributions of all scores are closely aligned with the straight line, suggesting approximate normality. Furthermore, according to the central limit theorem, "if a researcher has a population with mean μ and standard deviation σ and takes sufficiently large random samples from the population with replacement, then the distribution of the sample means will be approximately normally distributed." Given the use of a final random sampling technique, the sample size of 261 was deemed sufficiently large to satisfy this condition.



Results of the factor analysis: The 30 questionnaire items went through exploratory factor analysis. The research used the Principal Axis Factoring (PAF) as the extraction method to extract 4 factors. Initially 6 factors were envisaged namely, the research supervisor's competence and availability, availability of research infrastructure, time allocation to research related activities, research culture, access to quality research paper, and students level of satisfaction with the research output. However, all items (4) access to quality research papers were eliminated due to poor loading. Most of the items had a loading less than .30. The rest of the items 29 were condensed into five factors as demonstrated in the scree plot in Figure 1.



Figure 1. Scree Plot of Factor Loadings

As shown in Figure 1, the scree plot demonstrates a pronounced flattening after the 5th component (factor), suggesting that only 5 factors were sufficiently loaded by the various items. Based on prior theoretical support and the 'levelling off' of eigenvalues in the scree plot (see Figure 1) after the fourth factor, as well as the insufficient number of primary loadings and the difficulty in interpreting the sixth and subsequent factors, the four-factor solution, which explained 78.8% of the variance, was selected. Given these results, the 5-factor model was deemed appropriate for further parametric analysis. The factor loadings are presented in Table

Table 1. Rotated Factor Matrix						
	Factor					
	1	2	3	4	5	
RSKSA1				0.58		
RSKSA2				0.577		
RSKSA3				0.579		
RSKSA4				0.564		
TA1	0.798					
TA2	0.763					
TA3	0.666					
TA5	0.798					
RC1			0.536			
RC3			0.841			
RC4			0.546			
RI1					0.511	
RI2					0.507	
RI4					0.739	
SLS3		0.502				
SLS5		0.562				
SLS6		0.609				



Some items were further removed in order to improve upon the factor loadings. Example question item 5 of research supervisors' competence (I am happy with how quickly the supervisor responds to my request) item 6 (the supervisor provides me with satisfactory working conditions) and item 7 the supervisor motivates me when sourcing external funds) were removed because the loadings were less than .30. Under time allocation item 4 (How many hours in a week did you spend consulting colleagues and experts on issues related to your work) was removed because it had cross loadings with other items. 3 more questionnaire items under Research Facilities and Infrastructure were eliminated because the loadings were less than .30. Given this, the 17-item 5-factor solution was deemed appropriate. The description of the 17 items is presented on Table 2.

Item Code	Description	Factor
RSKSA1	My Thesis supervisor was readily available anytime I	Research
	needed him.	Supervisor's
RSKSA2	My supervisor provided feedback that helped me direct my research activities	Competence
RSKSA3	The Supervisor checked regularly to ensure that I was working consistently and on task	
RSKSA4	I am happy with how quickly the supervisor responds/responded to my requests for contact.	
TA1	How many hours per week did you spend reading research papers?	Time Allocated to Research
TA2	How many hours in a week do/did you spend consulting colleagues and experts on issues related to your research work?	Activities
TA3	How many hrs in a week did you spend working on your thesis write up?	
TA5	How many hrs a week did you spend accessing documents and related works?	
RC1	I had access to a good range of seminars in my research area	Research Culture
RC3	I had frequent opportunities to discuss my research with other researchers including research students	
RC4	The research community in my research area influences my work	
RI1	I had a suitable working space when I am/was on campus	Research
RI2	I had a suitable working space when I am/was studying remotely	Facilities
RI4	There was appropriate access to physical library resources and facilities	
SLS3	I am satisfied with the quality of research articles and other	Students' Level
	supporting documents from the databases that were made accessible to me.	of Satisfaction



SLS5	I am satisfied with the kind of coaching and supervision I
	have had from my supervisor
SLS6	I am satisfied with the quality of my final research output

Results of validity, and reliability test of the Data

The researcher subjected the data to validity and reliability test to ensure that the results were valid and reliable. Two forms of construct validity measures were carried out. They include convergent and discriminant validity. Convergent validity refers to the degree to which multiple measures of a construct that theoretically should be related are in fact related (Geffen, Straub and Boudreau, 2000). For instance, the multiple indicators measuring students' perceptions of thesis supervisors' competence were assessed under convergent validity to ascertain whether the indicators converge to measure the underlying construct (Thesis Supervisors' Competence). Convergent validity was assessed using Average Variance extracted (AVE). The AVE indicates how much of the indicators variance can be explained by the latent variable. An AVE greater than .50 provides empirical evidence for convergent validity (Bagozzi & Yi 1988).

Discriminant validity refers to the degree to which the measures that should not be highly correlated with each other are actually distinct. Discriminant validity indicates the extent to which a given construct differs from other constructs (Anderson & Gerbig 1988). Fornell and Larkers (1981) recommends the shared variance approach in assessing the discriminant validity of constructs. The discriminant validity index is got by taking the square root of the AVE. For discriminant validity to exist, the index should be greater than the inter-construct correlation matrix. The results of convergent discriminant and composite reliability analysis are presented in Table 3.

Indicator	Latent Variable	Standardized	AVE	Alpha	Composite
		Loading			Reliability
RSKSA1	Supervisor Competence 1	0.58			
RSKSA2	Supervisor Competence 2	0.577			
RSKSA4	Supervisor Competence 4	0.579			
RSKSA5	Supervisor Competence 5	0.564	0.7582	0.8707	.725
T1	Time allocation 1	0.798			
T2	Time allocation 2	0.763			
T5	Time allocation 5	0.666	0.8678	0.9316	.820
RC1	Research Culture1	0.536			
RC3	Research Culture3	0.841			
RC4	Research Culture 4	0.546	0.7960	0.8921	.703
RI1	Research Infrastructure 1	0.511			
RI2	Research Infrastructure 2	0.507			
RI4	Research Infrastructure 4	0.739	0.7621	0.8729	.841
SLS3	Students Satisfaction 3	0.502			
SLS5	Students Satisfaction 5	0.562			
SLS6	Students Satisfaction 6	0.609	0.7462	0.8638	.704

Table 3. Validity and Reliability Test Results



As presented in Table 3, we assessed both the average variance extracted (AVE) and the standardized factor loadings to determine convergent validity. Following the criteria outlined by Fornell and Larcker (1981), the study found that the AVE for all constructs exceeded the threshold of 0.50, which is considered necessary for satisfactory convergent validity. Specifically, the AVE values ranged from 0.7462 to 0.8678, with a mean of 0.65, confirming that convergent validity was achieved. Additionally, all factor loadings were statistically significant, with each exceeding the minimum required threshold of 0.500 (see Table 2). These results align with the guidelines provided by Hair et al. (2010), which recommend that factor loadings above 0.50 are sufficient to establish convergent validity.

The study assessed discriminant validity using the Fornell-Larcker criterion, as outlined by Fornell and Larcker (1981). The analysis revealed that the square roots of the Average Variance Extracted (AVE) for each construct exceeded the correlations between constructs, indicating that the constructs were sufficiently distinct from one another. For example, the correlation between The Supervisors' competence construct and Time allocation construct was 0.820, which is lower than the respective square roots of their AVEs (.8395 for the competence construct and 0.9316 for Time allocation construct). These findings support the discriminant validity of our measurement model. This result is consistent with Fornell and Larcker's (1981) recommendation that constructs are considered discriminant when the square root of the AVE exceeds the correlation between them (see Table 2).

The composite reliability (CR) for each construct was calculated using SPSS software version 21, and all CR values exceeded the recommended threshold of 0.70, with values ranging from 0.75 to 0.90. This indicates adequate internal consistency for all constructs (Hair et al., 2010). According to Bagozzi and Yi (1988), a CR value of 0.70 or higher is generally considered acceptable for ensuring the reliability of the measurement model (see Table 2).

Data Analysis Procedure

Computing Composite Variables

The purpose of this analysis was to combine the multiple Likert scale items into a composite variable that represents the various items. For instance, Likert scale items RSKSA1, RSKSA2, RSKSA4, RSKSA5 measuring supervisors' competence were combined into a composite variable (Supervisors' competence) using SPSS version 20. The composite variable was created by computing the mean score across the selected Likert items. The individual items were treated as equally weighted, and the mean score was calculated to provide an overall measure of the various constructs. This method was chosen to ensure each item contributed to the composite variable in a balanced way, while preserving the variation within the data. This made it possible to compare, link and effectively analyse the data with other data such as data on students' performance in the Research Methods Course and thesis evaluations.

Results of the Structural Equation Analysis

The structural equation modelling technique was used to analyse the data and test the hypotheses. The structural equation model was evaluated using a variety of fit indices. The model demonstrated acceptable fit to the data: χ^2 (82.281) = 59, p = 0.024; RMSEA = 0.050, CFI = 0.936, TLI = 0.916, NFI = 0.815, indicating that the model provided a good representation of the data.



In terms of path coefficients, the model revealed significant relationships. The path from research supervisors' competence (Supervisor) to students' performance in thesis (Thesis Mark) was positive and significant ($\beta = .127$, SE = .0200, p < 0.05), suggesting a positive influence. Similarly, the path from students' academic performance in Advance Research Course (Research Mark) to students' performance in Research Thesis (Thesis Mark) was positive and significant ($\beta = .105$, SE = 0.048, p < 0.05). Again, the path from research supervisor's competence (Supervisor) to students' level of satisfaction with their research output (Satisfaction) was positive and significant (($\beta = .279$, SE = 0.098, p < 0.05). Lastly, the path from the availability of quality research facilities and infrastructure (Facilities) to Students level of satisfaction with their research output (Satisfaction) was positive and significant (($\beta = .155$, SE = 0.070, p < 0.05). The rest of the paths were insignificant as demonstrated in Table 4.

The coefficient of determination for students' performance in research thesis was $R^2 = 0.64$, indicating that 65% of its variance was explained by the predictors in the model. Similarly, the coefficient of determination for students' level of satisfaction with their own research output (Endogenous Variable 2) was $R^2 = 0.21$ suggesting that 21% of its variance was explained by the predictors in the model.

Direction of Relat	Estimate S.E.		C.R.	Р	
Thesis Mark <	Supervisor	.127	.200	.636	.043
Thesis Mark <	Time	.106	.189	.561	.045
Thesis Mark <	Culture	166	.145	-1.145	.252
Thesis Mark <	Facilities	133	.143	.933	.351
Thesis Mark <	Research Mark	.105	.048	2.177	.029
Satisfaction <	Supervisor	.279	.098	2.852	.004
Satisfaction <	Time	.138	.092	1.495	.013
Satisfaction <	Culture	.116	.071	1.632	.103
Satisfaction <	Facilities	.155	.070	2.216	.027
Satisfaction <	Research Mark	.027	.024	1.131	.258
Satisfaction <	Thesis Mark	.032	.034	.961	.336

Table 4: Results of Structural Equation Analysis



DISCUSSION

Four (4) research hypotheses were set to be tested. The discussions that follow are according to the research hypotheses.

Hypothesis 1.: Research supervisors' competence positively and significantly predicts Postgraduate Students' research output

The study aimed to explore how the competence of a research supervisor—defined by their knowledge, experience, and approachability—affects the quality of postgraduate students' research output. This inquiry was grounded in the hypothesis that a supervisor's competence influences two main areas:

- 1. The students' perception of their overall satisfaction with their thesis quality.
- 2. The assessment grade of the thesis as evaluated by both internal and external examiners (Thesis Mark).

To investigate this, the researchers used three specific questions to assess supervisors' competence, along with two metrics to evaluate the quality of research output namely the students' own satisfaction with their thesis and the thesis marks awarded by internal and external examiners.

The findings provided valuable insights into how the competence of research supervisors relates to the quality of students' research output. The study uncovered a positive and significant relationship between supervisors' competence and students' performance in thesis evaluations ($\beta = .127$, SE = .0200, p < 0.05). This suggests that when supervisors possess strong knowledge, relevant experience, and approachability, students tend to perform better in their thesis assessments. Additionally, supervisors' competence was found to positively influence students' satisfaction with their research output ($\beta = .279$, SE = 0.098, p < 0.05). This indicates that students who feel supported by competent supervisors are generally more satisfied with their research efforts.

The findings suggest that research supervisors play a critical role in determining the quality of postgraduate research in two key ways: First, competent supervisors, who offer relevant knowledge, experience, and accessibility, have a direct impact on students' thesis marks. This aligns with the understanding that a supervisor's expertise and guidance are crucial in navigating the research process. Second, when students perceive their supervisors as competent, they are more likely to feel satisfied with their research outcomes, a satisfaction likely influenced by the mentorship and support they receive throughout their academic journey.

This perspective reinforces the broader concept of postgraduate research as a mentorship experience, where supervisors provide not only academic guidance but also emotional and professional support. The role of the supervisor as a mentor—guiding students through both formal and informal channels—appears integral to the research experience and overall success. The results align with previous studies, such as those by Igbokwe (2019) and Muthiani et al. (2022), which also observed a positive correlation between supervisors' knowledge, experience, and competence and the quality of students' research output. These findings



underscore the importance of a research supervisor's competence in enhancing the quality of postgraduate research.

Hypothesis 2: Performance of students in Advanced Research Methods Course significantly predict postgraduate research quality?

This research hypothesis sought to determine the extent to which students' academic performance the Advanced Research Methods course could predict their performance in research thesis project. This was based on the hypothesis students' that performance in Advance Research Methods course influences two main areas:

- 1. The students' perception of their overall satisfaction with their thesis quality.
- 2. The assessment grade of the thesis as evaluated by both internal and external examiners (Thesis Mark).

To investigate this, the researchers used the marks students obtained in the Advance Research Methods Course, along with two metrics to evaluate the quality of research output namely the students' own satisfaction with their thesis and the thesis marks awarded by internal and external examiners. The results suggest that students' academic performance in Advance Research Course positively and significantly predicts their performance in Research Thesis (B = .105, SE = 0.048, p < 0.05). The influence of students' academic performance in Advance Research Methods on their levels of satisfaction was however positive but insignificant. ($\beta =$.027, SE = 0.024, p > 0.05). The Advance Research Methods course is expected to help research candidates to acquire knowledge, skills and competencies in both qualitative and quantitative research methods. The positive and significant prediction of thesis marks by performance in the Advanced Research Methods course suggests that the course effectively prepares students for the more rigorous aspects of research, including thesis development. This reinforces the notion that providing students with a solid foundation in research methods is crucial for their success in postgraduate research projects. The findings support the idea that courses like Advanced Research Methods are not only beneficial in helping students gain theoretical knowledge but also in fostering the practical skills needed to execute and present research at a high standard.

On the other hand, the insignificant prediction of students' satisfaction with their thesis based on performance in the Advanced Research Methods course highlights the complexity of satisfaction as a construct. Satisfaction is multifaceted and cannot be solely determined by academic performance. This suggests that, while a well-designed research methods course can certainly improve a student's technical abilities, it may not necessarily impact how students feel about the outcome of their research or the overall process. The results are consistent with the findings of Muthiani, et al (2022) who reported that research skills such as skills in topic identification; statement of the problem; criticizing, identifying research gaps and connecting reviewed literature with the current study; choosing research design; making appropriate research tools; and establishing appropriate data analysis methods determine the quality and completion time for postgraduate research.



Hypothesis 3: Research facilities/infrastructure significantly predict quality postgraduate research output

Facilities such as serene classrooms, internet infrastructure, ICT centres quality laboratories and libraries are fundamental to the delivery of quality research output. These facilities aid students in their various research activities in areas including accessibility of journal articles, laboratory practical, research data analysis just to mention a few. The hypothesis sought to determine whether the availability of research facilities and infrastructure significantly influences the quality of Postgraduate research output. This was based on the hypothesis that the availability of these facilities affects two main areas:

- 1. The students' perception of their overall satisfaction with their thesis quality.
- 2. The assessment of the thesis as evaluated by both internal and external examiners (Thesis Mark).

The researchers used the questionnaire items to measure the availability of research infrastructure, along with two metrics to evaluate the quality of research output namely the students' own satisfaction with their thesis and the thesis marks awarded by internal and external examiners. The study revealed a weak and non-significant relationship between access to research facilities and student performance, as measured by the grades received for their theses ($\beta = -0.133$, SE = 0.143, p > 0.05). This suggests that the availability of such facilities does not effectively predict or enhance the quality of the theses, as assessed by both internal and external reviewers. This finding is particularly interesting, as it challenges the common assumption that robust research infrastructure is critical for producing high-quality work. Despite being viewed as essential for research success, access to these resources does not appear to translate into better academic performance in the context of thesis evaluations.

The lack of a significant relationship may be attributed to several factors. For one, the success of postgraduate students in their research could be more dependent on their engagement with the subject matter and their ability to work independently. Postgraduate research often requires students to adopt an autonomous approach, suggesting that their academic performance may hinge more on individual effort and skill rather than the physical or digital resources available. Additionally, the complexities involved in thesis evaluation may play a role. Thesis assessments typically involve various criteria, such as originality, depth of analysis, and clarity of argumentation—criteria that are not always directly linked to the availability of research facilities.

Conversely, the study found a positive and statistically significant relationship between access to research facilities and students' satisfaction with the quality of their theses ($\beta = 0.155$, SE = 0.070, p < 0.05). This indicates that when students have access to well-equipped facilities, they are more likely to report higher levels of satisfaction with their work. This finding suggests that research facilities positively contribute to students' confidence in the quality of their research. Access to robust infrastructure—such as journals, databases, and lab equipment—facilitates a smoother workflow, which may enhance the overall research experience and lead to greater satisfaction, even if it does not result in higher thesis grades.

This satisfaction is likely due to improved access to essential resources. When students can readily obtain the tools, data, and literature they need, their research process is likely to be more efficient and less frustrating. Additionally, the availability of resources such as the internet and



laboratory space helps minimize logistical challenges, enabling students to conduct thorough research. While the availability of research infrastructure may not directly influence thesis grades, it is important to recognize that academic performance in thesis evaluations is multifaceted. Thesis evaluations involve subjective assessments from reviewers, where factors such as research originality and theoretical contributions may outweigh the mere availability of resources.

Hypothesis 4: The amount of time Postgraduate students spend on research related activities positively predict the quality of their research thesis

Time allocation and utilisation is an important variable that has been found to predict the academic performance of students. This study sought to determine whether the time Postgraduate students apportion to research related activities predict the quality of their research thesis. This was based on the hypothesis the availability of these facilities affects two main areas:

- 1. The students' perception of their overall satisfaction with their thesis quality.
- 2. The assessment of the thesis as evaluated by both internal and external examiners (Thesis Mark).

The researcher used three (3) questionnaire items measure the time students spent on 3 research related activities, along with two metrics to evaluate the quality of research output namely the students' own satisfaction with their thesis and the thesis marks awarded by internal and external examiners. The study revealed a positive and significant relationship between time allocated to research related activities and student performance, as measured by the grades received for their theses ($\beta = .106$, SE = .189, p < 0.05). The study further found a statistically significant relationship between time students apportion to the research related activities and their level of satisfaction with the quality of their research output ($\beta = .138$, SE = .092, p < 0.05)

The study's results provide valuable insights into how the time students dedicate to research activities impacts both their performance and satisfaction. One of the key findings demonstrates a significant and meaningful relationship between the hours' students invest in research and the grades they receive for their theses. Specifically, the analysis revealed a beta coefficient of 0.106, indicating a positive correlation, and the significance level (p < 0.05) suggests that this relationship is unlikely to be due to chance. In other words, students who allocate more time to their research activities generally achieve higher thesis grades. This supports the expectation that greater research effort leads to better academic outcomes. It implies that students who commit more focused time to their research are likely to produce higher-quality work, which is reflected in their grades.

Additionally, the study found a noteworthy association between the time spent on research activities and students' satisfaction with the quality of their research output ($\beta = 0.138$, p < 0.05). This positive correlation suggests that students who dedicate more time to their research report greater satisfaction with the quality of their work. This finding underscores the notion that both perceived research quality and student satisfaction are influenced by the amount of time invested. Those who allocate more time to their research process are likely to feel more engaged and confident in their work, which in turn leads to higher satisfaction. It may also indicate that students who invest significant effort gain a deeper understanding of the research process, boosting their confidence in the validity of their findings.



Both findings are statistically significant (with p-values less than 0.05), confirming that these relationships are unlikely to have arisen by chance. This reinforces the reliability of the results, suggesting that the time students allocate to research directly affects both their academic performance and their satisfaction with the quality of their research. Bratti and Staffolani (2013) investigated time allocation and educational production functions using a theoretical model in which students decide the optimal allocation of their time between lecture attendance, self-study and leisure. They similarly found a significant relationship between time students spend on academic activities and their academic achievement. This research highlights the importance of allocating sufficient time to research activities. Students could benefit from enhancing their time management skills to ensure they dedicate adequate time to each stage of their research. This, in turn, could lead to improvements in both their academic performance and their satisfaction with the research process.

Hypothesis 5: *Research culture significantly predicts postgraduate research output quality*

Research culture encompasses the behaviours, values, expectations, attitudes and norms of our research communities. It influences researchers' career paths and determines the way that research is conducted and communicated. The study sought to determine whether the research culture of the student significantly predicts the quality of Postgraduates research output. This was based on the hypothesis students research culture influences two main areas:

- 1. The students' perception of their overall satisfaction with their thesis quality.
- 2. The assessment of the thesis as evaluated by both internal and external examiners (Thesis Mark).

To investigate this, the researcher used three main items to measure students research culture, along with two metrics to evaluate the quality of research output namely the students' own satisfaction with their thesis and the thesis marks awarded by internal and external examiners. The results suggest that Students' research culture and insignificantly predicts their performance in Research Thesis (β =.-.166 , SE = .145, p > 0.05). The influence of students' research culture on their levels of satisfaction was however positive but insignificant. ($\beta =$.027, SE = 0.024, p > 0.05). The negative β value suggests that there might be a very slight inverse relationship between research culture and thesis marks, though this is statistically insignificant. The p-value (greater than 0.05) indicates that this result is not reliable enough to suggest a meaningful impact. Therefore, there isn't enough evidence to conclude that students' research culture influences the quality of their research as assessed by examiners. The positive β value suggests that students with a stronger research culture tend to report slightly higher satisfaction with their thesis. However, this relationship is statistically insignificant, meaning that the effect is so small and uncertain that it cannot be considered reliable. The results imply that the research culture of students does not exert significant impact on the quality of their research output. Similarly, their level of satisfaction with the quality of their research output has little to do with their research culture. Thus even though research culture influences researchers' career paths and determines the way that research is conducted and communicated it does not necessarily contribute significantly in determining the research quality of Postgraduates. Research cultures are built on the values, expectations and behaviours that shape how we support, deliver and communicate our research. They are built and maintained by the actions, interactions, behaviours and processes that we all encounter and perform while



Volume 5, Issue 2, 2025 (pp. 100-123)

undertaking or supporting research. The AMOS graphical illustration of the theoretical model is presented in Figure 2.



Figure 2. A model of postgraduates' research Quality,

CONCLUSION AND RECOMMENDATIONS

In conclusion, this study provides valuable insights into the complex and multifaceted nature of postgraduate research quality. It is evident that the competence of supervisors, education in research methods, and effective time management play crucial roles in shaping student outcomes. However, the impact of research culture and facilities on academic performance remains less clear. Institutions should consider these findings as they refine their strategies for postgraduate education. This involves prioritizing the training of capable supervisors, offering comprehensive courses in research methods, fostering effective time management, and improving research environments to enhance both student satisfaction and academic success.



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Volume 5, Issue 2, 2025 (pp. 100-123)

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Volume 5, Issue 2, 2025 (pp. 100-123)

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