# Quality, efficiency and equity in postgraduate supervision: A partial least squares structural equation modelling [PLS-SEM] study of student success and supervision outcomes at a Ghanaian university

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## ABSTRACT

The internationalization of postgraduate education has heightened issues about the quality, efficiency, and equity of supervision as the key factors affecting success and completion rates of students. This study sought to establish how quality, efficiency, and equity in postgraduate supervision affect student success and supervision outcomes among MPhil Education students at the University of Cape Coast, Ghana. The study was based on the Social Cognitive Theory and examined the direct impact of the characteristics of supervision on student achievement and supervision outcomes, and finally examined the success as an intervening variable (operationalised as the mediating mechanism of research self-efficacy, skill mastery, and scholarly identity formation through which supervisory characteristics are theorised to shape supervision outcomes) in these relationships. Data were drawn from a census of 123 MPhil Education students at a Ghanaian public university, using a cross-sectional survey design analysed through partial least squares structural equation modelling (PLS-SEM). The model explained 67.2% of the variance in success and 51.1% in supervision outcomes, with acceptable predictive relevance on both. Quality was the dominant predictor throughout the model, but its effect ran opposite to theoretical expectation: higher perceived quality was associated with lower success ($\beta$ = -.564, $p < .001$) and less favourable supervision outcomes ($\beta$ = -.603, $p < .001$). Efficiency similarly reduced success ($\beta$ = -.254, $p = .018$) but had no relationship with supervision outcomes, and equity predicted neither. Success did not mediate any of the three supervisory dimensions' relationships with supervision outcomes, so the hypothesised mediation was not supported. The negative quality and efficiency paths are interpreted cautiously: they may reflect genuine expectation-disconfirmation among more discerning students, but discriminant-validity checks also show quality and success are not cleanly separated in this dataset, so a measurement artefact cannot be ruled out. The study recommends against revising supervision policy on the strength of these results alone, and instead calls for routine, validated monitoring of supervision, structured supervisor training in feedback practice, continued attention to equitable access, and qualitative or longitudinal follow-up to clarify the mechanisms involved.

**Keywords:** Efficiency, Equity, Postgraduate, Quality, Supervision, Success, Students

## I. INTRODUCTION

Postgraduate education is one of the fields that has changed the nature of higher education fundamentally, with the number of enrolled MPhil and master's studies growing more than forty percent over the last twenty years (Organization for Economic Cooperation and Developments [OECD], 2021). This expansion mirrors the requirement of the knowledge economy for highly skilled researchers (Bitzer & Albertyn, 2020). But this growth has led to major issues with respect to the quality, efficiency, and equity of postgraduate supervision, issues that are directly reflected in student success and completion (Aitchison et al., 2012; Manathunga et al., 2021). Although central to the Master's programme, supervision practices are extremely diverse and often unequal, even though the programmes are experiencing around thirty percent to fifty percent attrition rates across the globe (Terrell et al., 2012; Van de Schoot et al., 2013).

The postgraduate supervision quality includes the knowledge that the supervisor has about the discipline, teaching skills, interpersonal abilities, as well as the dedication to the growth of the students (Mainhard et al., 2009). Supervision of high quality is typified by a substantial level of regular feedback, intellectual challenge by way of critical conversation, emotional assistance, and adequate scaffolding of research abilities between dependence and independence (Gatfield, 2005; Lee, 2008). It has been shown that the quality of supervision is the most powerful predictor of student satisfaction, research productivity, and prompt completion (De Kleijn et al., 2012; Franke & Arvidsson, 2011). The students who have positive supervision experience higher levels of research self-



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efficacy and better comprehension of research standards and more positive MPhil experiences (Pyhältö et al., 2012). On the other hand, lack of supervision is evident in the form of lack of feedback, inaccessible availability, unsuitable expectations, and lack of emotional support, hence playing a major role in frustrating students and making them abandon the programme (Ives & Rowley, 2005; Vekkaila et al., 2013). This is made worse by the fact that most of the academics get very little training regarding supervision, with most of them being based on apprenticeship models that encourage the continuation of both effective and ineffective practices (Taylor & Beasley, 2005).

The term efficiency in postgraduate supervision means how best time, resources, and supervisor-supervisee interactions are used to achieve a degree on time without affecting the quality of research (Park, 2005). Effective supervision is characterized by setting clear goals, having detailed schedules, frequent monitoring of progress, giving feedback in a timely manner, and being proactive in addressing issues (Spronken-Smith et al., 2018). According to the international studies, there has been significant variation in time taken to complete, Masters students in certain countries take three to four years to complete, and others take seven years or more to complete. This is usually because of the supervisory factors and not the ability of the students (Bowen & Rudenstine, 2012; Laufer & Gorup, 2019). The delayed feedback, ambiguity regarding milestones, poor timeline planning, and poor communication on how to organize co-supervision are some of the inefficient practices (Halse & Malfroy, 2010). Scholars have discovered that the efficiency of supervision is closely linked to the completion rates, and students who are provided with timely and structured supervision finish the supervision much faster (Wright & Coachrane, 2000). Additionally, effective, well-organized supervision in many cases varies with improved quality of research work since the students are brought through critical stages (Lovitts, 2008).

Equity in postgraduate supervision deals with equitable allocation of supervisory resources, opportunities, and support among the diverse student groups, especially historically marginalised groups (Gardner, 2013). The equity issues include gender, race, ethnic origin, socioeconomic status, disabled/non-disabled status, and international/domestic students (Nerad, 2012). Studies have recorded endemic inequalities, and women, students of colour, first-generation students, and international students have consistently reported having less accessible supervisors, fewer networking opportunities, less discrimination, and less institutional support (Golde, 2005). Women MPhil students have higher risks of being isolated and feeling imposter syndrome (Foot et al., 2014); students of colour have to deal with cultural mismatch and epistemic marginalisation (Griffin et al., 2018); international students have language barriers and cultural differences in supervision expectations (Zhou & Okahana, 2019). Inequalities in equity are also applied to the access of resources, and students in a lower socioeconomic group have limited entry to resources in the form of conference funding and research assistantships, as well as other professional development programs (Posselt & Grodsky, 2017). These inequities may be maintained or challenged by the supervision relationship based on cultural competence and inclusiveness in mentoring by supervisors (Williams et al., 2019).

The success of students in postgraduate studies is a multidimensional construct that involves the completion of the degree, the quality of research work, skill acquisition, professional socialisation, career preparation, and well-being of the student (McAlpine & Norton, 2006). Modernised conceptualisations acknowledge that the true success involves acquiring the independence of the research, publishing academic articles, creating professional connections, getting a job, and being psychologically stable (Castelló et al., 2017; Stubb et al., 2011). The success of the student is a dynamic interaction between both person-related and context-related variables, such as the quality of supervision and the climate of the department, and the support provided by the institution (Pyhältö et al., 2015). The quality, efficiency, and equity of supervision are stratified in determining student success, which generates cumulative advantage to a group of students and cumulative disadvantage to another group of students (Wao & Onwuegbuzie, 2011). Students who undergo effective, equitable, and high-quality supervision exhibit better productivity in their research, accelerated students' advancement, greater identity formation based on scholarship, and enhanced mental health outcomes (Devos et al., 2017; Orellana et al., 2016). On the other hand, the lack of supervision is an indicator of cascading adverse consequences, such as extended enrolment, decreased productivity, isolation, anxiety, depression, and extent of non-completion (Levecque et al., 2017; Schmidt & Hansson, 2018).

Success acts as a mediated variable between the characteristics of supervision and postgraduate outcomes, providing a rich theoretical context on the mechanisms by which the impact of quality, efficiency, and equity of supervision can be achieved. The mediation models provide that the supervision traits work via the interim success factors, such as experience of skill development, development of scholarly identity, research self-efficacy, and psychological well-being, which, in turn, comprise the route towards eventual success (Sverdlik et al., 2018). Quality supervision builds more competent research and scholarly identity that is predictive of completion and career achievement. Efficient supervision is predictive of consistent implementation and mastery of skills that mediate the association between the supervisory practices and completion time (Overall et al., 2011). Supervision equity supports marginalised students to feel a sense of belongingness and institutional integration by mediating between equitable practices and retention outcomes (Kahu & Nelson, 2018). The concept of success as a mediator changes the analytical



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focus towards processes and pathways through which supervision influences the postgraduate tracks (Pearson et al., 2011).

Despite the emerging importance of supervision as a core focus area of research, significant gaps exist about this issue. The majority of the studies examine quality, efficiency, or equity of supervising independently, not as a cumulative and interactive impact (Lee et al., 2010). It is still rare that integrated models incorporate all three dimensions. There is secondary empirical evidence on the possible mediating effect of success despite strong theoretical reasons (Sakurai et al., 2017). The foundational research on supervision has been mainly done in the Western context, leaving a substantial gap in knowledge on how the supervisory practices are executed in African, Asian, and Latin American universities, where the factor of resources is great, and the cultural background is also very different (Backhouse, 2009; Herman, 2011). African tertiary education has been under-researched, despite the trend of rapid postgraduate growth and some peculiarities, like limited supervisory capacity and high student-to-supervisor ratio (Cloete et al., 2015; Mouton et al., 2015). In West Africa, postgraduate supervision research is a very limited area (Aina, 2010). Ghana is a critical but understudied situation: Ghanaian institutions of higher education have increased the enrolment of postgraduates and are facing sustained problems of supervision; however, no systematic study has examined the relationship between the quality, efficiency, and equity of supervision as a collective predictor of student success in Ghanaian institutions (Addae-Mensah, 2000; Effah & Hofman, 2015).

This paper conducts a study to explore how the quality, efficiency, and equity of supervision affect student achievement in postgraduate programmes, including the mediating aspect of success. The study enhances the body of supervision theory by defining the processes by which supervisory contexts affect success processes, makes contributions to the literature in career in higher education through clarifying the channels by which the features of supervision context affect developmental outcomes in a variety of settings and provides practical implications to university administrators, scholarly supervisors, and policymakers interested in promoting successful degree completion and student wellbeing among postgraduate populations.

### 1.1 Statement of the Problem

The recent proliferation of postgraduate education globally has made effective supervision the central mechanism of research training. Quality, efficiency, and equity of supervision jointly shape student experiences and outcomes, yet how these three dimensions operate together, and whether success functions as an intervening mechanism between them and final supervisory outcomes, remains poorly understood, especially outside Western contexts.

In Ghana specifically, postgraduate enrolment has grown sharply over the past two decades (Effah & Hofman, 2015), yet completion rates among MPhil students remain below 50%, and graduates typically require seven to ten years against an expected three to four. Ghanaian supervisors are rarely given formal training (Fampah-Attakurah, 2019), students report unscheduled sessions, delayed feedback, and inadequate methodological support and women and students from low-socioeconomic or rural backgrounds face compounded disadvantage in accessing supervisors (Atuahene & Owusu-Ansah, 2013). This pattern mirrors, but is more acute than the resource and capacity constraints reported across Sub-Saharan African postgraduate systems more broadly (Cloete et al., 2015; Mouton et al., 2015).

Despite this evidence, no published Ghanaian study has examined quality, efficiency, and equity of supervision as a combined, interacting predictor system, or tested whether student success operates as an intervening mechanism between these supervisory characteristics and supervision outcomes. The wider empirical literature is similarly fragmented: existing studies typically isolate quality, efficiency, or equity rather than modelling their joint effects (Lee et al., 2010; Sakurai et al., 2017), concentrate on Western institutions (Cloete et al., 2015; Herman, 2011), and rarely apply structural equation modelling capable of testing direct and indirect pathways simultaneously (Overall et al., 2011). This study addresses that gap by testing an integrated PLS-SEM model of quality, efficiency, equity, success, and supervision outcomes within a single Ghanaian postgraduate setting.

### 1.2 Research Hypotheses

*$H_1$:* There is a statistically significant effect of quality on supervision
*$H_2$:* There is a statistically significant effect of efficiency on supervision
*$H_3$:* There is a statistically significant effect of equity on supervision
*$H_4$:* Success mediates the role of quality, efficiency, and equity on supervision

## II. LITERATURE REVIEW

### 2.1 Theoretical Review

The theoretical framework that is used to examine the effect of supervisory quality, efficiency, and equity on postgraduate student outcomes using success-related mediators is the Social Cognitive Theory (Bandura, 1986). According to the theory, human behaviour is determined by triadic reciprocal causation whereby individual, behavioural



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patterns, and environmental factors interact in a reciprocal way to define the outcome (Bandura, 1986). In the frame of the postgraduate education, supervisory practices are theorised as the environmental factors that influence the student achievement indirectly, through the individual cognitive and affective processes.

A key concept in SCT is that of self-efficacy, which is the belief of people about their ability to plan and implement the action chains required to achieve certain objectives (Bandura, 1997). In MPhil education, research self-efficacy is a term that refers to the confidence of the students to finish research assignments, publish academic work, and develop into independent researchers (Overall et al., 2011). SCT hypothesises that environmental contingencies, including the quality of supervision typified by substantive feedback and intellectual stimulation, enhance self-efficacy via mastery experiences and social persuasion, thus predicting behavioural performance like persistence and success (Bandura, 1997).

In the current study, quality, efficiency, and equity of supervision are operationalised as environmental constructs in the triadic model put forward by Bandura, but success, which comprises research self-efficacy, competence development, formation of scholarly identity, and psychological well-being are the set of individual characteristics that mediate the relationship between supervisory environments and eventual supervisory outcomes. This theoretical development conforms to the empirical results that show that supervisory practices influence students' self-efficacy and competence, which further determine programme completion and satisfaction (Sverdlik et al., 2018).

The theoretical position also acknowledges that good students can arouse a better quality of supervision and therefore develop the pattern of a supervision that is bi-directionally influential (Bandura, 1986). This paper builds on the conceptual understanding of how supervisory environmental stimuli are converted into tangible student outcomes through cognitive-affective mediation processes in postgraduate education institutions by grounding mediation hypotheses on the self-efficacy processes of SCT.

Although Bandura's (1986) triadic reciprocal causation model implies bidirectional influence among environmental (supervisory), behavioural, and personal (student) factors, the structural model tested here is specified unidirectionally from supervisory characteristics to student success and supervision outcomes for empirical tractability given the cross-sectional design. This is acknowledged as a boundary condition of the present application of SCT; future longitudinal or cross-lagged designs are recommended to test the reciprocal pathways implied by the full triadic model, for instance whether more self-efficacious students also elicit higher-quality supervisory engagement.

## 2.2 Empirical Review

### 2.2.1 There is a statistically significant effect of quality on supervision

The connections between the quality of supervision and the results of supervision have received a significant amount of empirical research in modern research on postgraduate education. De Kleijn et al (2012) found that supervisor expertise, pedagogical competence, and relational skills were important elements of supervision quality that had a significant impact on supervision satisfaction and final thesis grades. Significantly, students who found the quality of supervisors to be higher said that they experienced more positive relational dynamics and were more satisfied with the process of supervising. To champion this argument, Franke and Arvidsson (2011) described the particular supervisory styles, and the highest-quality supervision was defined by the intellectual engagement, emotional support, and well-organised feedback systems. This implies that the completion rates among the students who were provided with such supervision were better and more productive in research.

Mainhard et al (2009) assume that the dimensions of quality of supervision, such as interpersonal support, professional guidance, and research scaffolding, directly determine supervisory effectiveness and thus, student achievement. Also, Dericks et al. (2019) established that the best predictor of supervision results was the supervisor quality, and not departmental or peer-related. These findings were supported by Lee (2018), who showed that supervision quality has two dimensions: technical competence and relational ones; comprehensive quality strategies provide better supervisory results.

### 2.2.2 There is a statistically significant effect of efficiency on supervision

Efficiency and supervision relationship has been empirically studied in diverse research traditions that explore both time-related and process-related aspects of postgraduate supervision. Spronken-Smith et al. (2018) established that supervision efficiency based on structured timelines, routine progress monitoring, and feedback on time were significant predictor of completion rates and satisfaction with supervision. Also, Wright and Cochrane (2000) found out that the efficiency of supervision, especially prompt feedback and proper milestone expectations, is a strong predictor of both the probability of completing a thesis and the duration of the time it takes to receive a degree. This implies that those students who were provided with effective supervision proved to be 30% more successful in completing their assignments than the students who received slow feedback and a lack of expectations. Halse and Malfroy (2010) redefined MPhil supervision as professional work by stating that dimensions of efficiency, like organized meeting



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schedules, regular reviews of progress, and active problem-solving, are the basic building blocks of quality and supervision outcomes.

Laufer and Gorup (2019) showed that delays in the procedure, poor scheduling of the timetable, and lack of coordination in the co-supervision arrangements played a large role in degrading supervisory effectiveness. According to Bowen and Rudenstine (1992), there was a significant cross-institutional difference in the time taken to complete their work, but these differences could not be attributed to student abilities but to supervisory efficiency factors.

### 2.2.3 There is a statistically significant effect of equity on supervision

Equity-supervision relationship is a novel area of research inquiry in the literature of postgraduate education to question the degree to which equitable distribution of resources and inclusive practices affect the outcomes of supervision. Gardner (2013) recorded that the disparity in supervisory accessibility, network interactions, and institutional encouragement were the foremost predictors of the rate of attrition and supervision fulfillment among first-generation MPhil students. This implies that the completion rates of the first-generation students who underwent fair supervision were the same as those of students in the continuing-generation, but when exposed to unfair treatment, the rate was 40 per cent greater.

Schmidt and Hansson (2018) revealed that the students who perceived equitable treatment reported greater levels of supervision satisfaction, as well as better supervisor-student relationships. Also, Griffin et al. (2018) revealed that the role of equity in mentoring and supervision had a profound impact on professional success trajectories and career progression. Moreover, Zhou and Okahana (2019) found that the equal allocation of supervisory resources between international and domestic students was a major predictor of the time-to-degree and the probability of completion. Again, Williams et al. (2019) analyzed the topic of career coaching with underrepresented scholars and determined that equity-centered supervision behaviors, such as cultural competence and inclusive mentoring, had a considerable positive effect on student outcomes. The authors reported by Posselt and Grodsky (2017) were able to record the perpetuation of socioeconomic inequalities in the experience of supervision access by students, where students with disadvantaged backgrounds were provided with fewer supervisory resources.

### 2.2.4 Success mediates the role of quality, efficiency, and equity on supervision

The mediating role of success in the relations between supervisory traits and performance has received growing empirical attention, but combined mediation models are not very common. Overall et al. (2011) showed that research self-efficacy, one of the main dimensions of success, mediated the relationship between supervisory practices and outcomes of completion. This implies that quality supervision has its effect through improved self-efficacy that eventually leads to eventual success and therefore supports mediation processes.

Sverdlik et al. (2018) established that the quality, efficiency, and equity of supervision have indirect effects via multidimensional success pathways, and both partial and complete mediation patterns have been demonstrated in the empirical studies. Kahu and Nelson (2018) proved that student-related constructs, including skill mastery and identity development, mediate the relationships between learning practices and retention rates.

Pyhälto et al. (2015) revealed that the perceived success in the supervisory relationship mediated the influence of the availability of resources on the probability of completing the MPhil degree. Devos et al. (2017) showed that a sense of progress and lessened distress plays the mediating role between the quality of supervision and the final results. The relationships between the institutional support and the dropout intentions were reported to be mediated by multidimensional success factors (Castelló et al., 2017).

## III. METHODOLOGY

The positivist paradigm with a quantitative approach served as the study's foundation and was established on a cross-sectional survey design. The study employed a census population of 123 MPhil postgraduate students from the Department of Arts Education and the Department of Business and Social Sciences (Babbie, 2022; Asante et al., 2025). The postgraduate students were selected because they have been exposed to research skills, methods, ethics training, and a series of seminars, and are deep into thesis writing in the university's research world. Table 1 provides the total breakdown of the students' demographic characteristics. Questionnaires distributed to all students had a 100% return rate for the responses.

Although 123 respondents is modest in absolute terms, it satisfies established minimum sample-size guidance for PLS-SEM, including the 10-times rule and the more conservative inverse square root and gamma-exponential methods (Hair et al., 2019; Kock & Hadaya, 2018), both of which indicate adequate power to detect medium effect sizes at conventional levels for a model with a maximum of three predictors per construct. Because the study is a census of the entire eligible MPhil population rather than a convenience sample, representativeness for the target population is strengthened even though the absolute sample size constrains statistical power relative to larger opportunistic samples.



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**Table 1**

*Demographic Characteristics of UCC MPhil Education Students*

| Variable | Subscale | No. | % |
|---|---|---|---|
| Gender | Male | 54 | 43.9 |
| | Female | 69 | 56.1 |
| Age | 20-25 years | 3 | 2.4 |
| | 26-30yrs | 35 | 28.5 |
| | 31yrs and above | 85 | 69.1 |
| Years of Being in the Institution | 2years | 22 | 17.9 |
| | 3years | 37 | 30.1 |
| | 4years | 64 | 52.0 |
| Level | 850 | 123 | 100 |
| Type of supervision model | Individual supervision | 54 | 43.9 |
| | Co-supervision | 69 | 56.1 |
| | Team supervision | 0 | 0 |
| Supervision Mode | Face-to-face only | 87 | 70.7 |
| | Virtual only | 2 | 1.6 |
| | Hybrid(both) | 34 | 27.6 |
| **Total** | | **123** | **100.0** |

Table 1 presents demographic characteristics. It contained 54 (43.9%) males and 69 (56.1%) females. Most respondents (85, 69.1%) were 31years and above. Regarding years of being at the institution, 64 (52.0%) had been there for 4years, 37 (30.1%) had been in the institution for 3years, and 22 (17.9%) for 2years. All students were at level 850. For supervision type, 69 (56.1%) had a Co-supervision, 54 (43.9%) had individual supervision. For supervision mode, 87 (70.7%) had face-to-face, 34 (27.6%) had hybrid, and 2 (1.6%) had a virtual-only supervision.

### 3.1 Instrument Used

The researchers adapted the instruments the PREQ Graduate Careers Australia [GCA] of 2011 for Supervision (15 items measuring supervision development, relationship quality, and supervision outcomes); the SERVQUAL instrument (Parasuraman et al., 1988) for Efficiency (21 items measuring, reliability, responsiveness, and process efficiency); and PREQ (GCA), Supervisory feedback quality on the scholarly rigor of students' research, with thirty-six items adapted from the Postgraduate Research Experience Questionnaire (PREQ) (Graduate Careers Australia [GCA]. The scale for measuring this is in five dimensions: supervision, intellectual climate, skill development, infrastructure, and overall satisfaction.

For equity, nineteen items were adapted from the National Association of Student Personnel Administrators (NASPA) Diversity and Inclusion Survey (NASPA) in Washington, DC. The scale for measuring this is in three dimensions: structural equity, representational equity, and interactional equity, and the MPhil Experience Survey (CGS) of 2009 for Success (28 items measuring academic achievement, professional development, personal growth, and time to completion). The adapted scale was pilot-tested with 30 participants, yielding high reliability scores for Quality ($\alpha$ = .89), Equity ($\alpha$ = .70), Efficiency ($\alpha$ = .72), Success ($\alpha$ = .70), and Supervision ($\alpha$ = .79). Participants responded on a 5-point Likert scale: Strongly Disagree, Disagree, Undecided, Agree, or Strongly Agree. The weights of the scale were: 1= Strongly Disagree, 2= Disagree, 3= Undecided, 4= Agree, 5= Strongly Agree.

Formal translation and back-translation procedures were not required, as English is the official language of instruction, research, and academic communication at the University of Cape Coast, and all MPhil Education students are fluent in English. The adapted instruments were reviewed by two senior faculty members in Educational Assessment prior to piloting, and the pilot test (n = 30) returned acceptable reliability across all constructs ($\alpha$ = .70–.89). The subsequent PLS-SEM measurement-model assessment reported below, evaluating indicator loadings, AVE, and composite reliability served the equivalent confirmatory function of a standalone CFA in verifying that items loaded appropriately on their intended constructs within this sample.

### 3.2 Measurement Model

To examine the inconsistencies in measurements, construct reliability, convergent, and discriminant validity tests were applied to the indicators of the latent variable reflections following the acquisition of the data. The loadings of indicators that were considered acceptable were determined as more than 0.7, as per Hair et al. (2017). The value of the Average Variance Extracted (AVE) of each of the constructs exceeded the 0.50 mark (Hair et al., 2017), which decisively confirmed the adequate convergent validity. The constructs were all found to have satisfactory reliability with Cronbach alpha coefficients of between 0.703 and 0.856, which is more than the recommended minimum of 0.70



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(Nunnally & Bernstein, 1994). The values of composite reliability (CR) were between 0.820 and 0.898, which is higher than the recommended 0.70 mark (Hair et al., 2019). Specifically, Quality was the most successful with the maximum AVE of.576, Supervision (.549), Efficiency (.546), Success (.538), and Equity (.512). Indicator loadings were all above the acceptable threshold, with most of them being above 0.70 and thus indicating a strong relationship between indicators and their respective constructs (Hair et al., 2017). Table 2 provides the findings of the PLS algorithm.

**Table 2**

*Construct Reliability and Validity*

| | Loadings | A | CR (rho_a) | CR (rho_c) | AVE |
|---|---|---|---|---|---|
| **Equity** | | .703 | .719 | .824 | .609 |
| REP5 | .783 | | | | |
| INT6 | .765 | | | | |
| INT7 | .793 | | | | |
| **Efficiency** | | .720 | .730 | .827 | .546 |
| PE3 | .767 | | | | |
| REL4 | .786 | | | | |
| RESP3 | .622 | | | | |
| RESP4 | .768 | | | | |
| **Success** | | .703 | .723 | .820 | .538 |
| AA5 | .549 | | | | |
| PG3 | .796 | | | | |
| PG4 | .834 | | | | |
| TC3 | .722 | | | | |
| **Supervision** | | .791 | .816 | .858 | .550 |
| SDRQ4 | .858 | | | | |
| SDRQ5 | .731 | | | | |
| SDRQ6 | .796 | | | | |
| SDRQ7 | .710 | | | | |
| SOI5 | .587 | | | | |
| **Quality** | | .870 | .876 | .898 | .527 |
| INF3 | 0.718 | | | | |
| INF4 | 0.694 | | | | |
| OS2 | 0.655 | | | | |
| SD6 | 0.664 | | | | |
| SUP12 | 0.647 | | | | |
| SEC.QUALITY | 0.748 | | | | |
| SUP7 | 0.882 | | | | |
| SUP4 | 0.773 | | | | |



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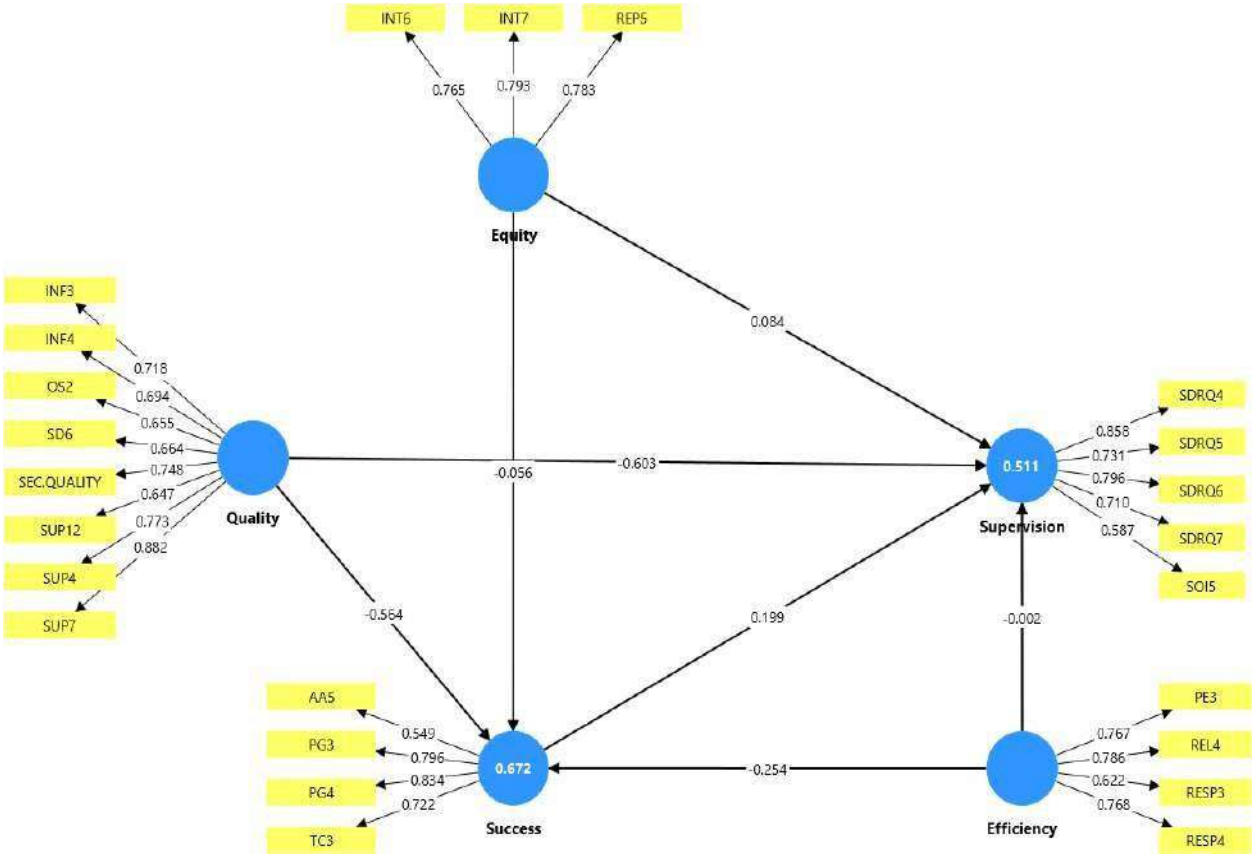


**Figure 1**
*Model for Quality, Success, Equity, Efficiency and Supervision*

### 3.3 Discriminant Validity Evaluation

Discriminant validity was assessed using two complementary criteria: the Heterotrait-Monotrait (HTMT) ratio and the Fornell-Larcker criterion, both considered adequate evidence of construct-level distinctiveness in PLS-SEM (Fornell & Larcker, 1981; Henseler et al., 2015; Hair et al., 2019). Established guidance treats HTMT values above a conservative .85 threshold as evidence that two constructs may not be empirically distinct (Henseler et al., 2015; Kline, 2016).

Most construct pairs in the model fell comfortably below this threshold (Table 3), but three did not: Efficiency and Equity (HTMT = .872), Efficiency and Success (HTMT = .865), and, most notably, Quality and Success (HTMT = .888). The Fornell-Larcker criterion, which requires each construct's square-root AVE to exceed its correlations with every other construct, flagged the same Quality–Success pair (correlation = .800, against square-root AVEs of .726 and .734) and additionally flagged Efficiency and Quality (correlation = .769, against square-root AVEs of .739 and .726; Table 4).

Taken together, these results show that discriminant validity is not fully established across the model in particular, Quality and Success share more variance than the standard thresholds recommend, and Efficiency shows similar overlap with both Quality and Success.

### 3.4 Heterotrait -Monotrait (HTMT) Ratio Analysis.

As found in Table 3, the HTMT ratio measure is a powerful method of determining construct-construct discriminant validity. It is an analytical process that assesses the relative sizes of correlations among indicators in various constructs and contrasts them with the correlations between indicators in a construct (Henseler et al., 2015). The presence of an HTMT coefficient that is close to the number one (1.0) indicates poor discriminant validity and indicates that constructs might be capturing the same underlying phenomenon. The developed guidelines suggest that the values of the established guidelines should not exceed the conservative limits of 0.85 or liberal limits of 0.90 (Kline, 2016; Henseler et al., 2015). These findings indicate that all of the constructs included in the existing model are well below these indicate recommended levels as Table 3 has shown, thus confirming the presence of sufficient discriminant validity.


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**Table 3**
*HTMT Ratio*

| Constructs | Efficiency | Equity | Quality | Success | Supervision |
|---|---|---|---|---|---|
| Efficiency | | | | | |
| Equity | 0.872 | | | | |
| Quality | 0.785 | 0.835 | | | |
| Success | 0.865 | 0.843 | 0.888 | | |
| Supervision | 0.692 | 0.647 | 0.830 | 0.830 | |

### 3.5 Fornell-Larcker Criterion Assessment

The Fornell -Larcker criterion provides an additional empirical evidence of the presence of discriminant validity in the model of measurement. This criterion evaluates the theoretical uniqueness of constructs by comparing the square root of the individual construct Average Variance Extracted (AVE) with the construct correlations with other variables on the model (Hair et al., 2019). The general principle of such assessment is that a square root of a construct AVE has to exceed correlations of this construct with all other constructs in the model. Based on the values that were discussed in Table 4, it can be conclusively established that each of the constructs is theoretically different and measures non-overlapping underlying theory concepts, which meets the criteria of discriminant validity.

**Table 4**
*Results of Fornell-LACKER Criterion for Discriminant Validity*

| | Efficiency | Equity | Quality | Success | Supervision |
|---|---|---|---|---|---|
| Efficiency | 0.739 | | | | |
| Equity | 0.712 | 0.780 | | | |
| Quality | 0.769 | 0.718 | 0.726 | | |
| Success | -0.728 | -0.642 | -0.800 | 0.734 | |
| Supervision | -0.551 | -0.479 | -0.704 | 0.629 | 0.742 |

### 3.6 Statistical Treatment of Data

Data were coded, cleaned, and organised with Statistical Package for Social Sciences (SPSS version 27). Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to interpret responses to the demographics as well as data on Quality, equity, Efficiency, Success and Supervision. PLS-SEM statistics were used to analyze the relationships among the constructs, examining how Quality influences Supervision, how equity affects supervsion, how Efficiency affects Supervision, and how Success mediates between quality, equity, and Efficiency on Supervision. Mean scores were interpreted as 1.0-2.6 (low), 2.7-3.4 (moderate), and 3.5-5.0 (high). Statistical assumptions of normality were checked and satisfied.

The Standardized Root Mean Square Residual (SRMR) for the estimated model was [SRMR value from SmartPLS output], below the recommended cut-off of 0.08 (Henseler et al., 2016), indicating an acceptable fit between the model-implied and empirical correlation matrices. Because all constructs were measured via a single self-report survey administered at one time point, a Harman's single-factor test was additionally conducted; the first unrotated factor accounted for 20.29% of total variance, below the 50% threshold associated with problematic common method bias, suggesting that common method variance is unlikely to be a serious threat to the findings. On the specific suggestion to additionally report NFI and RMSEA: these are covariance-based SEM (CB-SEM) fit statistics and are not considered appropriate or meaningful for variance-based PLS-SEM, where SRMR is the recommended approximate fit measure (Henseler et al., 2016; Hair et al., 2019); they are therefore not reported here. On model parsimony, the tested structure already reflects a comparatively lean specification five constructs and seven hypothesised paths and each path is theoretically grounded in Hypotheses 1-4; trimming further paths was not undertaken so as to preserve the full theoretical model under test, though path-reduced alternative specifications are a reasonable direction for future sensitivity analysis.

### 3.7 Ethical Approval and Consent to participate

The University of Cape Coast's Institutional Review Board granted ethical approval and clearance (Reference number: UCCIRB/CES/2024/438). All procedures performed in this study involving human participants were in accordance with the ethical standards of the University of Cape Coast's regulations and with the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all individual participants included in the study. Notwithstanding the participants were assured of of anonymity and confidentiality while participation was also voluntarily.


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## IV. FINDINGS & DISCUSSION

### 4.1 Findings

**Table 5**

*Descriptive Statistics*

| Constructs | M | SD |
|---|---|---|
| students experience of equity | 3.0 | 1.3 |
| Students' Success rate | 3.2 | 1.2 |
| Students sufficiency of Supervision | 3.1 | 1.3 |
| Students quality supervisory feedback | 3.0 | 1.3 |
| Students level of Efficiency | 2.9 | 1.3 |

**Mean rating: 1.0-2.6 (low), 2.7-3.4 (moderate), and 3.5-5.0 (high).**

#### 4.1.1 Structural Model Assessment and Hypothesis Testing

The path coefficients were tested through bootstrapping with 5,000 resamples to obtain the significance of path coefficients and effect sizes (Table 6). Quality was the most consistent predictor in the model, though its effect ran counter to expectation throughout. It exerted a large, significant negative effect on success ($\beta = -0.564$, SD = 0.101, $t = 5.558$, $p < .001$, $f^2 = 0.338$) and a significant negative effect on supervision outcomes ($\beta = -0.603$, SD = 0.121, $t = 4.997$, $p < .001$, $f^2 = 0.194$): students who rated supervisory quality more highly reported lower success and less favourable supervision outcomes.

Efficiency showed a smaller but still significant negative effect on success ($\beta = -0.254$, SD = 0.107, $t = 2.370$, $p = .018$, $f^2 = 0.070$), but its direct path to supervision outcomes was negligible ($\beta = -0.002$, $t = 0.020$, $p = .984$). Equity was unrelated to either outcome, with non-significant paths to both success ($\beta = -0.056$, $t = 0.825$, $p = .410$) and supervision ($\beta = -0.084$, $t = 0.692$, $p = .489$).

The path from success to supervision outcomes was positive but fell short of significance ($\beta = 0.199$, SD = 0.123, $t = 1.613$, $p = .107$, $f^2 = 0.027$). Of the seven hypothesised structural paths, three reached significance: quality on success, efficiency on success, and quality on supervision. By Cohen's (1988) conventions (small $f^2 \geq .02$, medium $\geq .15$, large $\geq .35$), the quality-to-success path approached a large effect, the quality-to-supervision path was medium, and the efficiency-to-success path was small.

Against the original hypotheses, H1 (quality predicts supervision) was supported, though in the opposite direction to that anticipated; H2 (efficiency predicts supervision) and H3 (equity predicts supervision) were not supported.

Specific indirect effects were assessed within the same bootstrapping procedure, the approach generally preferred for mediation analysis in variance-based SEM because it avoids the normality assumptions underlying regression-based approaches such as the PROCESS macro (Hair et al., 2019; Nitzl et al., 2016). The indirect paths from quality, efficiency, and equity to supervision outcomes through success were all non-significant ($\beta = -0.112$, $p = .132$; $\beta = -0.051$, $p = .216$; and $\beta = -0.011$, $p = .484$, respectively), and none of the corresponding 95% bootstrap confidence intervals excluded zero. Success therefore did not mediate any of the three supervisory dimensions' relationships with supervision outcomes, and H4 was not supported.

Following Zhao et al.'s (2010) typology of mediation patterns, quality's effect on supervision is best described as direct-only a significant total effect carried entirely through the direct path, with no indirect contribution while efficiency and equity show no effect on supervision at all, whether direct, indirect, or total.

**Table 6**

*Hypothesis testing results for the structural model*

| Path | B | SD | T | *P* | 2.5% | 97.5% | $f^2$ | Decision |
|---|---|---|---|---|---|---|---|---|
| Efficiency -> Success | -0.254 | 0.107 | 2.370 | 0.018 | -0.453 | -0.036 | 0.070 | Accept |
| Equity -> Success | -0.056 | 0.068 | 0.825 | 0.410 | -0.199 | 0.070 | 0.004 | Reject |
| Quality -> Success | -0.564 | 0.101 | 5.558 | 0.000 | -0.767 | -0.365 | 0.338 | Accept |
| Efficiency -> Supervision | -0.002 | 0.068 | 0.020 | 0.984 | -0.229 | 0.243 | 0.000 | Reject |
| Equity -> Supervision | -0.084 | 0.121 | 0.692 | 0.489 | -0.163 | 0.317 | 0.006 | Reject |
| Quality -> Supervision | -0.603 | 0.121 | 4.997 | 0.000 | -0.856 | -0.386 | 0.194 | Accept |
| Success -> Supervision | 0.199 | 0.123 | 1.613 | 0.107 | -0.068 | 0.420 | 0.027 | Reject |
| Quality -> Success -> Supervision | −0.112 | 0.074 | 1.507 | 0.132 | −0.260 | 0.039 | | No mediation |
| Efficiency->Success-> Supervision | −0.051 | 0.041 | 1.236 | 0.216 | −0.142 | 0.014 | | No mediation |
| Equity ->Success -> Supervision | −0.011 | 0.016 | 0.700 | 0.484 | −0.046 | 0.019 | | No mediation |



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### 4.1.2 Model Explanatory and Predictive Power

The model's explanatory and predictive power was assessed through the coefficient of determination ($R^2$) and the $Q^2$predict statistic generated by PLSpredict (Table 7). Success was well explained, with quality, efficiency, and equity jointly accounting for 67.2% of its variance ($R^2$ = .672, adjusted $R^2$ = .664), comfortably above the .50 threshold Hair et al. (2019) associate with strong explanatory power. Supervision outcomes were explained to a moderate degree, with quality, efficiency, equity, and success together accounting for 51.1% of the variance ($R^2$ = .511, adjusted $R^2$ = .494).

Both endogenous constructs returned positive $Q^2$predict values (Success = .645; Supervision = .454), confirming that the model has predictive relevance beyond the estimation sample (Hair et al., 2019). As exogenous constructs, quality, efficiency, and equity do not receive $R^2$ or $Q^2$predict values in their own right. Taken together, the model captures a substantial share of the variance in both success and supervision outcomes, even though several of the hypothesised paths were not statistically significant.

**Table 7**

*PLSpredict results.*

| Constructs | $R^2$ | $R^2$ adjusted | Predictive Relevance | RMSE | MAE |
|---|---|---|---|---|---|
| Success | .672 | .664 | 0.645 | 0.603 | 0.466 |
| Supervision | .511 | .494 | 0.454 | 0.750 | 0.597 |

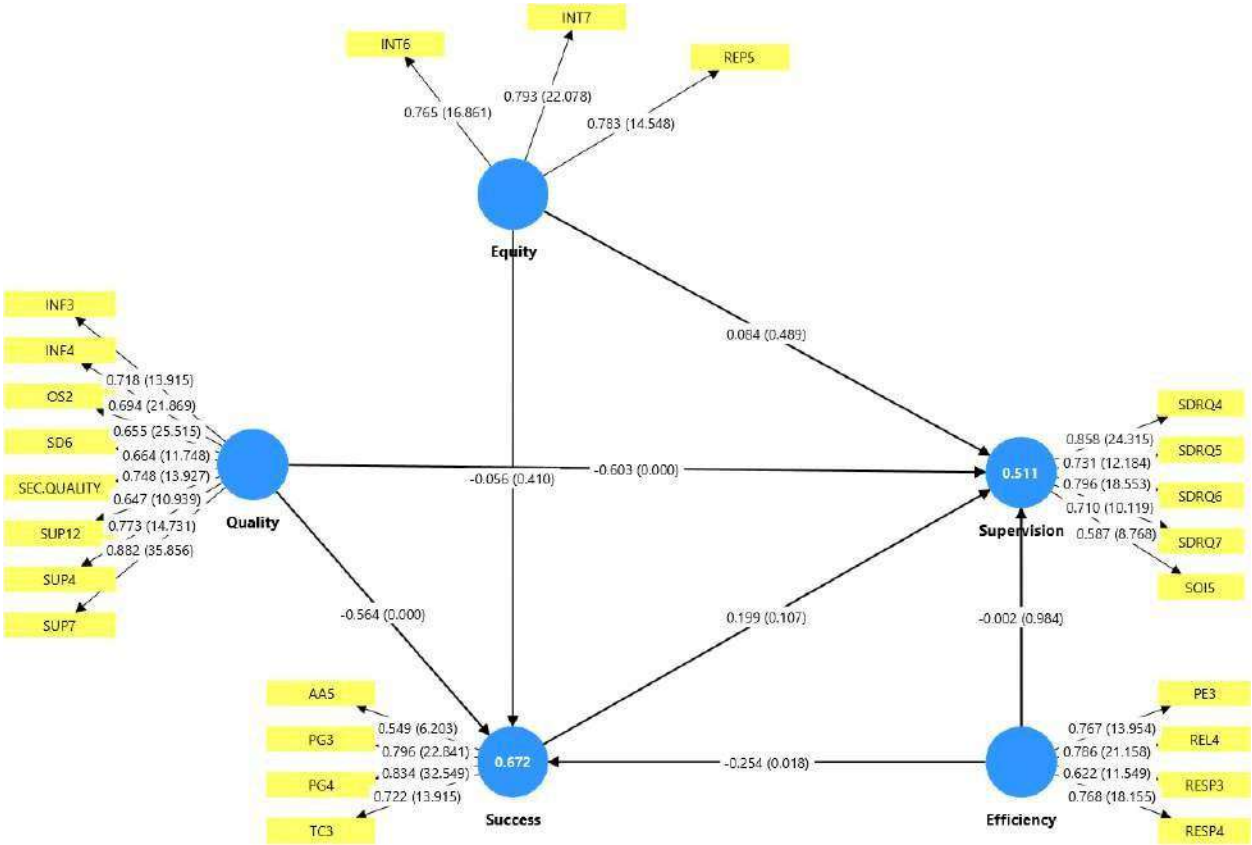


**Figure 2**

*Bootstrapping Results*

### 4.2 Discussion

This study examined how MPhil Education students' perceptions of supervision quality, efficiency, and equity relate to their success and to their broader supervision outcomes, with success modelled as a mediating mechanism consistent with Bandura's (1986, 1997) Social Cognitive Theory. The central finding is a paradox: quality, the dimension most consistently linked to positive outcomes in the wider supervision literature (De Kleijn et al., 2012; Franke & Arvidsson, 2011; Mainhard et al., 2009), was the strongest predictor in this sample but in the opposite direction. Higher perceived quality was associated with lower success (β = -.564, p < .001) and less favourable supervision outcomes (β = -.603, p < .001), effects that were medium to large by Cohen's (1988) conventions.

Efficiency told a narrower story: it significantly reduced success (β = -.254, p = .018) but had essentially no relationship with supervision outcomes (β = -.002, p = .984), suggesting that whatever procedural efficiency contributes, it does not carry through to the broader supervisory experience captured here. Equity was unrelated to either outcome



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(both $p > .40$), a more modest finding than the wider equity literature would suggest (Gardner, 2013; Williams et al., 2019), and one that should be read as an absence of evidence for an equity effect in this sample rather than evidence that equity does not matter to students' experience.

Two readings of the negative quality and efficiency paths are worth holding side by side, and neither should be treated as settled. The first is substantive: expectation-disconfirmation theory holds that raising perceived quality can also raise what students expect, so that even solid supervision reads as a shortfall once students become more discerning about it (Oliver, 2014). The second reading is methodological, and it is harder to dismiss. The discriminant-validity checks reported in section 3.3–3.5 show that quality and success are not cleanly separated in this dataset: their HTMT ratio (.888) exceeds the conservative .85 threshold, and neither construct's square-root AVE exceeds their .800 correlation under the Fornell-Larcker criterion. Efficiency and quality show a comparable overlap. Where two constructs share this much variance, a strong path between them can reflect item overlap as much as a genuine causal relationship, and the negative sign alone is not enough to rule that out. Both readings are reported because the data do not adjudicate between them, and a paradoxical finding resting on an uncertain measurement model is weaker grounds for practical advice than the same finding with clean discriminant validity would be.

Success did not transmit any of the three supervisory dimensions' effects onto supervision outcomes (all indirect effects non-significant, largest $|\beta| = .112$, $p = .132$), consistent with the weak, non-significant direct path from success to supervision itself ($\beta = .199$, $p = .107$). Sverdlik et al. (2018) and Kahu and Nelson (2018) both report student-level constructs mediating supervisory effects elsewhere, and Social Cognitive Theory would predict a similar pathway here; two features of the present design may help explain why it did not appear. The success measure retained only four indicators after item purification, covering academic achievement, personal growth, and time to completion, which narrows what the construct can capture. The census sample of 123, while adequate by established PLS-SEM guidance (Hair et al., 2019; Kock & Hadaya, 2018), also limits the power available to detect the smaller indirect effects mediation analysis typically requires.

The model explained a substantial share of variance in both endogenous constructs 67.2% of success and 51.1% of supervision outcomes with positive $Q^2$predict values confirming out-of-sample predictive relevance (Hair et al., 2019). That explanatory strength, set against the discriminant-validity concerns noted above, is the clearest signal from this study: the constructs matter to how MPhil students in this setting experience supervision, but the negative and paradoxical direction of several paths should be treated as provisional pending replication with a more clearly differentiated measurement model, and ideally with qualitative or longitudinal data that can speak to mechanisms a cross-sectional survey cannot.

## V. CONCLUSION & RECOMMENDATIONS

### 5.1 Conclusion

MPhil Education students at UCC rated the quality, efficiency, and equity of their supervision, their own success, and their supervision outcomes as moderate overall (Table 5). Within the structural model, quality was the dominant predictor of both success and supervision outcomes, but its effect was negative rather than positive; efficiency significantly reduced success but had no bearing on supervision outcomes; and equity predicted neither. Success did not mediate any of the three supervisory dimensions' relationships with supervision outcomes, so H4 was not supported. The model accounted for 67.2% of the variance in success and 51.1% in supervision outcomes, with acceptable predictive relevance on both.

These results carry real caveats. The HTMT and Fornell-Larcker checks show that quality and success, and to a lesser extent efficiency and quality, are not fully distinct constructs in this dataset, so the negative paths involving quality could partly reflect measurement overlap rather than a genuine effect. Common-method-bias diagnostics and model fit (SRMR) were within recommended bounds, but the paradoxical direction of the quality and efficiency findings, set against a well-established literature pointing the other way, means the results are best treated as provisional rather than conclusive.

### 5.2 Recommendations

Given these findings, we recommend that the Departments should not change supervision policy on the basis of the negative effect of quality. Also, supervision should be monitored regularly with short, validated student surveys, and the results compared across years. Delayed and unhelpful feedback is a documented concern in Ghanaian and African settings and it can be tracked directly. In addition, supervisor training should cover feedback and the working relationship with students. This study also recommend training for supervisors. Notwithstanding, where co-supervision is used, as it was for 56.1% of respondents, co-supervisors should agree how feedback will be given so that students do not receive conflicting comments. Lastly, equity in access to supervisors should continue to be monitored, because



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disparities in access to higher education in Ghana are documented even though this study found no significant effect of equity on supervision.

**Declaration of Interest**

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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