Executive Leadership and Educational Quality Management in Primary and Secondary Schools: An Evaluation using PLS-SEM

Educational quality management is a central concern for basic education systems, and the leadership exercised by school headteachers is one of the organisational factors most frequently associated with it. Evidence on this association, however, has largely relied on bivariate correlations between summed scores, which neither distinguish between the distinct leadership styles that headteachers exhibit nor establish that the instruments used are measuring what they claim to measure. This study examines how three leadership styles — transformational, transactional and passive-avoidant — relate to educational quality management, understood as a multidimensional construct. A cross-sectional, non-experimental correlational design was applied to 301 respondents (35 headteachers and 266 teachers) from state basic education institutions in the district of Ayacucho, Peru, in 2026. Leadership was measured using the Multifactor Leadership Questionnaire (MLQ-5X) and quality management using a 22-item instrument covering the institutional, administrative, pedagogical and community dimensions. A variance-based structural equation model was estimated using partial least squares, with a two-stage higher-order specification. The measurement model met the criteria for internal consistency (Cronbach's alpha 0.81–0.89; rho_A 0.81–0.89; composite reliability 0.87–0.92), convergent validity (AVE 0.63–0.79) and discriminant validity (all 21 HTMT ratios below 0.85). Transformational leadership showed the strongest association with quality management (beta = 0.399, 95% CI [0.297, 0.497], f2 = 0.188), followed by passive-avoidant leadership in the negative direction (beta = -0.193) and transactional leadership (beta = 0.175). The model explained 33.7 per cent of the variance and demonstrated predictive relevance (Q^2 = 0.207). A multigroup comparison revealed no differences in the structural relationships between headteachers and teachers. As the study design is cross-sectional and correlational, the coefficients are interpreted as associations.

Keywords: *educational leadership; quality management; basic education; partial least squares; measurement invariance; Peru*

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Introduction

Basic education systems are increasingly evaluated on the quality of the management processes they uphold, rather than solely on the learning outcomes they report. In this shift, school leadership has moved from being a peripheral administrative concern to becoming a central focus of education policy. International reviews place it amongst the school-level factors most consistently associated with the conditions under which teaching takes place, although the magnitude of this association varies considerably depending on how the construct is conceptualised and measured: a three-level meta-analysis incorporating 493 independent effects from 108 studies published since 2000 places the average effect at r = 0.14, with leadership practices showing effect sizes ranging from r = .10 to r

= .26 (Tan et al., 2021), whilst a cross-cultural review covering the period 2006–2024 identifies a medium-sized effect of educational leadership on student achievement (Karadağ and Sertel, 2025). This variation does not constitute measurement noise: the mechanisms through which leadership influences school processes vary depending on the institutional context in which they are exercised (Wu et al., 2026). Three features of the available evidence motivate the present study.

The first is that leadership is frequently treated as a single, undifferentiated attribute. The full-range model distinguishes between transformational behaviours, which appeal to shared purpose and individual development; transactional behaviours, which operate through contingent rewards and active supervision; and passive-avoidant behaviours, characterised by delayed or absent intervention. These styles are conceptually distinct and, in the meta-analytic evidence, are associated with organisational outcomes to varying degrees and even with opposite signs: the synthesis of 57 independent datasets yields an overall association of r = .374, 95% CI [.247, .504], which, when disaggregated, reaches r = .569 for the transformational component and stands at r = .265 for the transactional component (Kasalak et al., 2022). The gap between these two figures is, in itself, a compelling argument for modelling the styles separately. Studies focusing on specific mechanisms reinforce this need, by documenting that job autonomy and trust in the headteacher mediate the relationship between transformational leadership and teacher performance (Khan, 2023) and that school leadership influences job commitment regardless of the school in which one works, with job satisfaction acting as a mediator at both levels of analysis (Ersan et al., 2024).

The second feature is that quality management is itself multidimensional. Institutional, administrative, pedagogical and community processes are governed by different actors and respond to different incentives; consequently, there is no reason to assume a priori that a single leadership style relates to all four in the same way. The empirical determination of school quality indicators using structural equation modelling shows that such quality breaks down into facets that do not covary uniformly with leadership (Ahmmed et al., 2022), and the combination of multilevel models with decision trees in cross-country comparisons reveals that the relationship between leadership, instructional practices and performance is highly context-dependent (Aydin et al., 2025). Similarly, the effect of distributed leadership on teacher satisfaction breaks down into a direct pathway ($\beta = .404$, $p < .001$), an indirect pathway via a supportive school climate ($\beta = .181$, $p < .001$) and a minor indirect pathway via the formative feedback environment ($\beta = .017$, $p < .001$), with school size acting as a moderating factor (Potužníková et al., 2025). Treating quality management as a single ordinal score disregards this structure.

The third feature—and the one with the most significant consequences—is that the psychometric properties of the instruments are rarely reported. When the association is estimated between two summed scores, the estimator carries over the measurement error from both instruments, and no evidence is provided that the two constructs are empirically distinguishable. This gap is particularly evident in the regional evidence, which defines the phenomenon and provides the contextual framework for the problem without accompanying it with the corresponding

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assessment of the measures: the association between managerial leadership and quality management in secondary-level institutions (Sedano and Aguilar, 2026), the systematic review of the literature on governance, managerial leadership and educational quality in the Peruvian public sector (Córdova and Cordova, 2026), the examination of constructivist leadership in an Ecuadorian educational network (Murillo and Rodríguez, 2024), the analysis of pedagogical leadership in a private institution (Ramirez, 2024) and the study of the role of the headteacher in Colombia (Ortega et al., 2022). Without a reported assessment of reliability, convergent validity and discriminant validity, an observed correlation cannot be distinguished from a shared methodological artefact.

The present study addresses all three features collectively: it specifies the three leadership styles as separate latent constructs, models educational quality management as a higher-order construct comprising its four dimensions, and reports the comprehensive evaluation of the measurement model — internal consistency, convergent validity, discriminant validity based on two independent criteria, common-method bias and measurement invariance across respondent roles — before interpreting any structural coefficients. This gives rise to three research questions: to what extent is each of the three styles associated with educational quality management once measurement error has been accounted for; whether the instruments used are internally consistent, convergent and empirically distinguishable from one another; and whether the estimated relationships hold across the two informant roles that observe school leadership from different perspectives. The contribution extends beyond the setting in which the data were collected: the proposed specification constitutes a template applicable wherever these instruments are used, and the Peruvian district serves as a testing ground, not as the sole basis for the assertion.

Theoretical Framework and Hypothesis Development

Executive leadership as a repertoire of behaviours

The full-range model conceives of leadership not as a single quantity but as a repertoire. Its analytical value lies in the fact that it accommodates behaviours of opposite nature within the same scale: transformational behaviour articulates a shared institutional purpose and addresses individual professional development; transactional behaviour operates through explicit exchanges of performance and reward; and passive-avoidant behaviour consists of the manager's withdrawal when faced with a decision that falls within their remit. Research into the day-to-day practice of headteachers supports this granular interpretation. Analysis of meetings as the basic unit of headteachers' work shows that leadership is exercised through micro-practices whose orientation—whether deliberative or purely administrative—determines which school processes are effectively managed (Midha, 2021). From a longitudinal perspective, the distribution of leadership is not decreed: it rests on a relational infrastructure that the school system itself must build up over time (Ekman and Packendorff, 2026). The repertoire, therefore, is not a trait of the individual but

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a property of the leadership actually exercised over each institutional process, and it is this property that an overall leadership score renders unobservable.

Quality management as an organisational construct

Educational quality management is understood here as the set of institutional, administrative, pedagogical and community processes through which an institution organises and sustains the conditions for teaching. Its multidimensional nature is not a measurement convention but a property of the object itself. Collaboration for educational change is conceptualised as a joint function of leadership and governance, organisational levels that are not reducible to one another (Campbell, 2024); in highly centralised school systems, the negotiation of teacher leadership through school-based reform produces management configurations that differ across dimensions (Ghamrawi et al., 2026). Cultural alignment, collaborative structures and internal talent pathways enhance staff engagement, retention and professional growth (Hughes and Davis, 2025), thereby linking the administrative and pedagogical dimensions through distinct mechanisms. The very stability of the leadership role influences these processes, as formalised by the bio-ecological model of leadership retention (Galdames et al., 2025). It follows that a leadership style may be associated with each dimension to varying degrees, and that aggregating the four into a single score imposes a homogeneity that the subject matter does not possess.

Hypotheses

Three hypotheses are derived from the combination of both frameworks; these are stated as associations because the design does not allow for directional inference, and are maintained in this formulation throughout the article.

H1. Transformational leadership is positively associated with educational quality management.

H2. Transactional leadership is positively associated with educational quality management, to a lesser extent than that posited in H1.

H3. Passive-avoidant leadership is negatively associated with educational quality management.

Materials and Methods

Design

The study followed a non-experimental, cross-sectional and correlational design: data were collected at a single point in time and no variables were manipulated or assigned; therefore, the coefficients quantify the strength and direction of association and do not identify causal effects. The analytical approach

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was variance-based structural equation modelling, estimated using partial least squares, for three stated reasons: the model includes a reflective-reflective higher-order construct; the objective combines explanation with out-of-sample prediction; and the indicators are five-point ordinal items whose distributional assumptions do not satisfy the requirements for covariance-based maximum likelihood estimation. There is a precedent for this choice in the study of leadership styles and dimensions of teacher performance (Saleem et al., 2020). The estimation utilised external weights in Mode A, a trajectory-weighting scheme and 5,000 bootstrap resamples.

Participants and sample

The population comprised 897 professionals from public primary and secondary schools in the district of Ayacucho, Peru (39 headteachers and 858 teachers). Participation was offered to all accessible schools during the fieldwork, and the sample comprised 301 respondents—35 headteachers and 266 teachers—representing 33.6 per cent of the population. The sample is a convenience sample and is reported as such: there was no probabilistic selection mechanism or stratification, and no claim to representativeness is made, given that the bootstrap intervals and permutation tests employed are conditional on the sample obtained. Both roles were retained in the analytical sample because they observe the same institutional processes from different perspectives, and their joint inclusion enables the assessment of invariance; given that there are documented perceptual differences between school leaders and teachers when evaluating transformational educational leadership (Silva et al., 2025), the comparison between roles constitutes a necessary verification.

The adequacy of the sample was assessed against the estimator actually used. Using the inverse square root method, the sample size required to detect a coefficient of magnitude $|\beta|$ with 80 per cent power at a 5 per cent significance level is $n \geq (2.486 / |\beta|)^2$. The expected magnitude was based on meta-analytic evidence rather than on a single primary study: 57 independent datasets ($N = 7{,}283$) yielded $r = .374$ with a 95 per cent confidence interval of [.247, .504] (Kasalak et al., 2022). Taking the **lower** limit as a conservative estimate gives $n \geq (2.486 / 0.247)^2 = 101.30 \rightarrow n = 102$, a requirement which the sample exceeds by a factor of 2.95; conversely, 301 cases detect any coefficient of magnitude $2.486 / \sqrt{301} = 0.143$ or greater. The calculation assesses the adequacy of the sample and did not determine the number of participants, which was set by access to the institutions; the sample size calculation is one-sided because the hypotheses are directional ( ), whilst the reported inference is two-sided and therefore more stringent; and a fixed case-to-parameter ratio was not used, as there is no established basis for variance-based estimators. The subgroup of managers ($n = 35$) is retained due to its value for the invariance assessment, with the detectable coefficients bounded at $2.486 / \sqrt{35} = 0.420$.

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Instruments

Leadership was measured using the Multifactor Leadership Questionnaire (MLQ-5X), which operationalises the full-range model through 20 transformational, 12 transactional and 4 passive-avoidant items, on a five-point agreement scale. The first two scales were represented by clusters constructed on the basis of their published subscale structure—four and three, respectively—and the passive-avoidant items were retained as individual indicators; this clustering balances the number of indicators per block and prevents a disproportionate weight of a 20-item block on the composite score, without altering the content of the scales. Educational quality management was measured using 22 items across four dimensions—institutional (6), administrative (6), pedagogical (6) and community-based (4)—with three sub-items in the first three dimensions and the four original items in the last. Table 1 details the resulting operationalisation.

Table 1. *Operationalisation of latent constructs*

Construct	Measurement method	Indicators	Response scale	Source scale
Transformational leadership	Reflective	4	5-point Likert scale	MLQ-5X, transformational scale (20 items, 4 subscales)
Transactional leadership	Reflective	3	5-point Likert scale	MLQ-5X, transactional scale (12 items, 3 subscales)
Passive-avoidant leadership	Reflective	4	5-point Likert scale	MLQ-5X, passive-avoidant scale (4 items)
Institutional quality management	Reflective	3	5-point Likert scale	Quality management questionnaire, institutional dimension (6 items, 3 sub-scales)
Administrative quality management	Reflective	3	5-point Likert scale	Quality management questionnaire, administrative dimension (6 items, 3 sub-sections)
Pedagogical quality management	Reflective	3	5-point Likert scale	Quality management questionnaire, pedagogical dimension (6 items, 3 sub-sections)

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Community quality management	Reflective	4	5-point Likert scale	Quality management questionnaire, community dimension (4 items)
Educational Quality Management (COS)	Reflective-reflective COS	4	Latent scores (stage 1)	Four first-order dimensions of quality

Note: COS = higher-order construct. The grouping follows the published subscale structure of each instrument. N = 301.

Content validity was established through expert judgement prior to fieldwork — instruments, consistency matrix and validation record — and a pilot study was conducted with 15 teachers not included in the analytical sample, in line with standard practice in the development and validation of school leadership instruments: scales of instructional leadership for headteachers (Lai and Lien, 2023), measurement of strategic leadership competence, whose three-factor model achieved an acceptable fit with CFI = .901 and RMSEA = .056 (Polat and Kara, 2026), future-ready leadership instruments (Lu et al., 2026) and joint validation of leadership, school climate and well-being (Villa and Pizarro, 2026). The administration took into account the cultural values that frame the exercise of school leadership in each context (Tan, 2022). Construct validity and reliability were not assumed: they were estimated on the analytical sample and are reported in the results using three measures of internal consistency — Cronbach's alpha tends to underestimate reliability in composite models and composite reliability tends to overestimate it, with rho_A falling between the two —, the average extracted variance, and two independent criteria of discriminant validity.

Procedure and data analysis

Data were collected via a self-administered questionnaire during the 2026 school year; participation was voluntary, responses were anonymous, and each respondent reported on the institution where they worked. The analysis proceeded in a fixed order, without interpreting any structural coefficients before completing the evaluation of the measurement model: descriptive statistics and distributional screening; first-order measurement model with internal consistency, convergent and discriminant validity; higher-order construct using the two-stage approach, with latent scores from the first stage as indicators; common-method bias due to total collinearity, without a marker variable; structural model with bootstrap resampling of 5,000 samples, 95 per cent percentile intervals, f2 effect sizes and internal variance inflation factors; explanatory power (R^2), predictive relevance (Q^2 via blindfolding, omission distance 7) and out-of-sample prediction (PLSpredict with 10-fold cross-validation against a linear reference model); and measurement invariance with a comparison of coefficients between roles via permutation (2,000 permutations). All analyses were run with a fixed estimation seed, so that each reported figure is reproducible.

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Results

Descriptive statistics and distributional screening

Table 2 reports the descriptive statistics for the seven first-order constructs. The means range from 2.64 to 3.34 on the five-point scale and the standard deviations from 0.87 to 0.96; the observed range covers the full scale in all cases. The absolute skewness does not exceed 0.161 and the absolute kurtosis does not exceed 0.724 for any construct.

Table 2. *Descriptive statistics for the first-order constructs (N = 301)*

Construct	Indicators	M	SD	Min.	Max.	Skewness	Kurtosis
Transformational leadership	4	3.28	0.93	1.00	5.00	-0.116	-0.365
Transactional leadership	3	3.02	0.94	1.00	5.00	-0.071	-0.724
Passive-avoidant leadership	4	2.64	0.87	1.00	5.00	0.161	-0.345
Institutional quality management	3	3.12	0.94	1.00	5.00	-0.036	-0.563
Administrative quality management	3	2.93	0.94	1.00	5.00	-0.109	-0.528
Educational quality management	3	3.34	0.96	1.00	5.00	-0.095	-0.667
Community-based quality management	4	2.81	0.88	1.00	5.00	0.123	-0.585

Note: M = mean; SD = standard deviation. M and SD were calculated based on the average score of the indicators for each construct. All values satisfy |skewness| < 1 and |kurtosis| < 1. N = 301.

Measurement model: reliability and convergent validity

Table 3 reports the external loadings and the three internal consistency coefficients for each construct. The 24 external loadings range from 0.741 to 0.903, above the criterion of 0.70; therefore, no indicator was removed from the measurement model. Cronbach's alpha ranges from 0.807 to 0.885, rho_A from 0.812 to 0.887 and composite reliability from 0.872 to 0.920; all three coefficients exceed 0.70 for all constructs, with rho_A falling between the other two in each case. The average extracted variance ranges from 0.631 to 0.789 and exceeds the criterion of 0.50 for all seven constructs.

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Table 3. *Measurement model: external loadings, internal consistency and convergent validity*

Construct	Indicator	Factor loading	Cronbach's alpha	rho_A	FC	AVE
Transformational leadership	TFL1	0.880	0.885	0.887	0.920	0.743
	TFL2	0.842				
	TFL3	0.855				
	TFL4	0.870				
Transactional leadership	TAL1	0.841	0.811	0.812	0.888	0.726
	TAL2	0.859				
	TAL3	0.855				
Passive-avoidant leadership	PAL1	0.778	0.821	0.828	0.881	0.650
	PAL2	0.794				
	PAL3	0.846				
	PAL4	0.804				
Institutional quality management	INQ1	0.852	0.809	0.815	0.887	0.724
	INQ2	0.828				
	INQ3	0.872				
Administrative quality management	ADQ1	0.903	0.813	0.836	0.889	0.727
	ADQ2	0.824				
	ADQ3	0.828				
Educational Quality Management	PEQ1	0.886	0.866	0.867	0.918	0.789
	PEQ2	0.889				
	PEQ3	0.890				
Community-based quality management	COQ1	0.798	0.807	0.817	0.872	0.631
	COQ2	0.741				
	COQ3	0.826				
	COQ4	0.811				

Note: FC = composite reliability; AVE = average variance extracted; TFL = transformational leadership; TAL = transactional leadership; PAL = passive-avoidant leadership; INQ = institutional quality; ADQ = administrative quality; PEQ = pedagogical quality; COQ = community quality. Criteria: loadings > .70; alpha, rho_A and FC > .70; AVE > .50. N = 301.

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Discriminant validity

Discriminant validity was assessed using two independent criteria. Table 4 reports the hetero-to-mono-trait correlation ratio for the 21 pairs of constructs: the highest ratio observed is 0.725 and all 21 fall below the criterion of 0.85.

Table 4. *Discriminant validity: ****hetero-mono-trait**** correlation ratio (HTMT)*

Pair of constructs	HTMT	Less than .85
TFL – TAL	0.499	Yes
TFL – PAL	0.304	Yes
TFL – INQ	0.566	Yes
TFL – ADQ	0.426	Yes
TFL – PEQ	0.517	Yes
TFL – COQ	0.458	Yes
TAL – PAL	0.192	Yes
TAL – INQ	0.422	Yes
TAL – ADQ	0.388	Yes
TAL – PEQ	0.386	Yes
TAL – COQ	0.278	Yes
PAL – INQ	0.189	Yes
PAL – ADQ	0.276	Yes
PAL – PEQ	0.408	Yes
PAL – COQ	0.383	Yes
INQ – ADQ	0.724	Yes
INQ – PEQ	0.725	Yes
INQ – COQ	0.640	Yes
ADQ – PEQ	0.657	Yes
ADQ – COQ	0.662	Yes
PEQ – COQ	0.641	Yes

Note. HTMT = hetero-uniformity-uniformity ratio; HTMT criterion < 0.85. TFL = transformational leadership; TAL = transactional leadership; PAL = passive-avoidant leadership; INQ = institutional quality; ADQ = administrative quality; PEQ = pedagogical quality; COQ = community quality. N = 301.

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Figure 1. *Integrates both criteria with the reliability evidence into a single display, shading each ratio according to its deviation from the criterion*

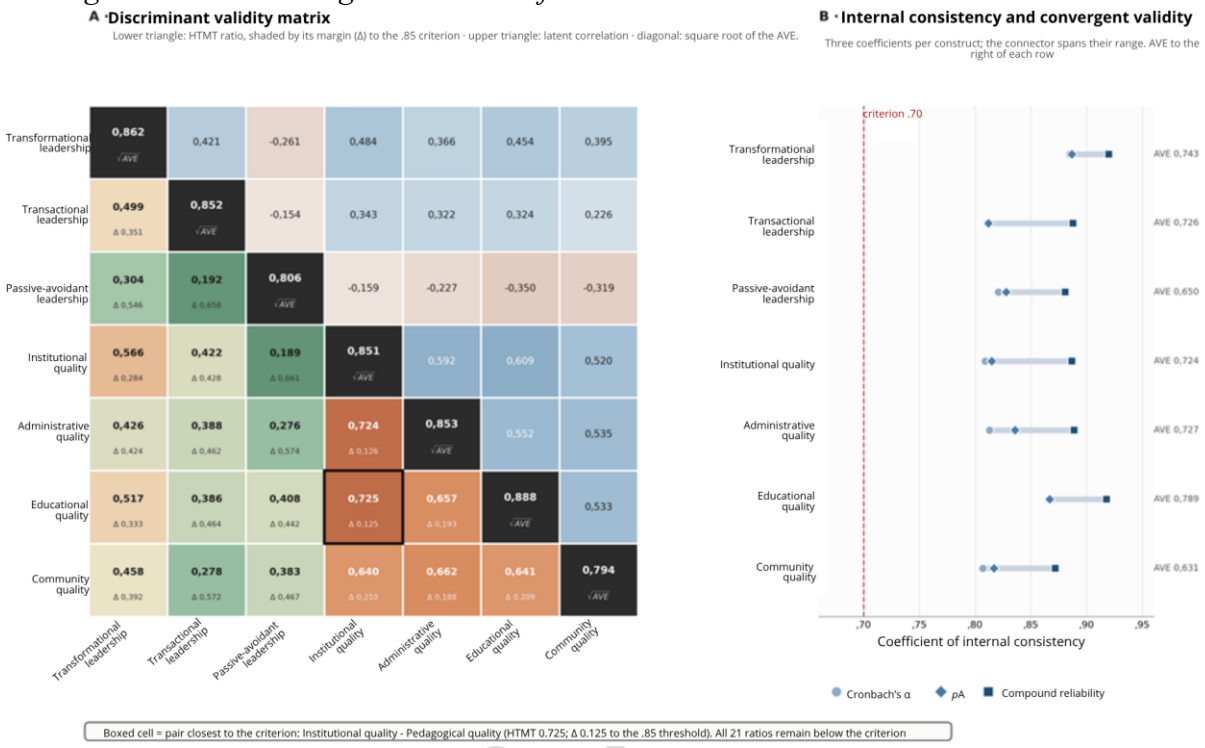


Figure 1. Integrated assessment of discriminant validity, internal consistency and convergent validity of the seven first-order constructs (N = 301). Panel A: the lower triangle shows the hetero-trait-mono-trait ratio (HTMT), shaded according to its margin (Δ) relative to the criterion of 0.85 and not according to its raw value; the upper triangle shows the latent correlations; the diagonal shows the square root of the extracted mean variance. The boxed cell indicates the pair closest to the criterion (Institutional quality – Pedagogical quality; HTMT = 0.725; Δ = 0.125); all 21 ratios fall below 0.85. Panel B: three internal consistency coefficients per construct, with the connector indicating their range. Cronbach's α ranges from 0.807 to 0.885; ρ_A, from 0.812 to 0.887; and composite reliability, from 0.872 to 0.920. The AVE ranges from 0.631 to 0.789 and exceeds 0.50 for all constructs. The 24 external loadings range from 0.741 to 0.903. Note: the two criteria for discriminant validity are independent and coincide, meaning that the constructs are empirically distinguishable before any structural coefficients are interpreted.

Table 5 presents the Fornell–Larker matrix. For each construct, the square root of its extracted mean variance exceeds its correlation with each of the remaining six constructs, meaning that both criteria are met.

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Table 5. *Discriminant validity: Fornell-****Larcker criterion*

Construct	TFL	TAL	PAL	INQ	ADQ	PEQ	COQ
Transformational leadership	0.862	0.421	-0.261	0.484	0.366	0.454	0.395
Transactional leadership	0.421	0.852	-0.154	0.343	0.322	0.324	0.226
Passive-avoidant leadership	-0.261	-0.154	0.806	-0.159	-0.227	-0.350	-0.319
Institutional quality management	0.484	0.343	-0.159	0.851	0.592	0.609	0.520
Administrative quality management	0.366	0.322	-0.227	0.592	0.853	0.552	0.535
Educational quality management	0.454	0.324	-0.350	0.609	0.552	0.888	0.533
Community-based quality management	0.395	0.226	-0.319	0.520	0.535	0.533	0.794

Note. Bold diagonal entries = square root of the AVE; off-diagonal entries = latent correlations. TFL = transformational leadership; TAL = transactional leadership; PAL = passive-avoidant leadership; INQ = institutional quality; ADQ = administrative quality; PEQ = pedagogical quality; COQ = community quality. N = 301.

Higher-order construct of educational quality management

Educational quality management was specified as a reflective-reflective higher-order construct and was estimated using a two-stage approach. Table 6 reports the loadings of the four dimensions on the second-order construct and its reliability: the loadings range from 0.783 to 0.840, with a Cronbach's alpha of 0.834, rho_A of 0.840, composite reliability of 0.889 and extracted mean variance of 0.667.

Table 6. *Higher-order construct of educational quality management (two-stage approach)*

Indicator / statistic	Value
Institutional quality management	0.838
Administrative quality management	0.806
Pedagogical quality management	0.840
Community quality management	0.783
Higher-order construct	
Cronbach's alpha	0.834
rho_A	0.840
Composite reliability	0.889
AVE	0.667

Note: AVE = average variance extracted. The latent scores from Stage 1 of the four dimensions of quality serve as indicators of the higher-order construct. N = 301.

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Common-method bias

As each respondent reported on both leadership and quality management, common-method variance was assessed using the total collinearity procedure, which does not require a marker variable. Table 7 reports the variance inflation factors obtained: the four constructs range from 1.13 to 1.52, all falling below the criterion of 3.3.

Table 7. *Common-method bias: total collinearity assessment*

Construct	Total collinearity VIF	Less than 3.3
Transformational leadership	1.52	Yes
Transactional leadership	1.26	Yes
Passive-avoidant leadership	1.13	Yes
Educational quality management (COS)	1.51	Yes

Note: VIF = variance inflation factor; COS = higher-order construct. VIF criterion < 3.3 under the procedure without a marker variable. N = 301.

Structural model

Table 8 reports the path coefficients with bootstrap inference. All three 95% confidence intervals exclude zero, and each coefficient exhibits the sign predicted a priori. Transformational leadership has the largest coefficient (beta = 0.399, EE = 0.051, 95% CI [0.297, 0.497], f2 = 0.188); passive-avoidant leadership shows a negative coefficient (beta = -0.193, f2 = 0.052) and transactional leadership a positive coefficient of lesser magnitude (beta = 0.175, f2 = 0.038). Only the transformational trajectory achieves a moderate f2; the other two fall within the small range. The internal variance inflation factors range from 1.08 to 1.28.

Table 8. *Structural model: trajectory coefficients, ****bootstrap**** inference and effect sizes*

Trajectory	beta	EE	95% CI	t	p	f2	VIF	Decision
Transformational leadership -> Educational quality management	0.399	0.051	[0.297, 0.497]	7.80	< 0.001	0.188	1.28	Retained
Transactional leadership -> Educational quality management	0.175	0.049	[0.080, 0.272]	3.55	< 0.001	0.038	1.22	Retained
Passive-avoidant leadership -> Educational quality management	-0.193	0.047	[-0.289, -0.103]	4.08	< 0.001	0.052	1.08	Retained

Note. SE = standard error; VIF = internal variance inflation factor. Bootstrap with 5,000 resamples and 95 per cent percentile intervals; two-tailed p-value based on the bootstrap standard error. VIF criterion < 3.3. A path is retained when its confidence interval excludes zero. N = 301.

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Figure 2. *Shows the estimated model together with the complete bootstrap distribution for each path*

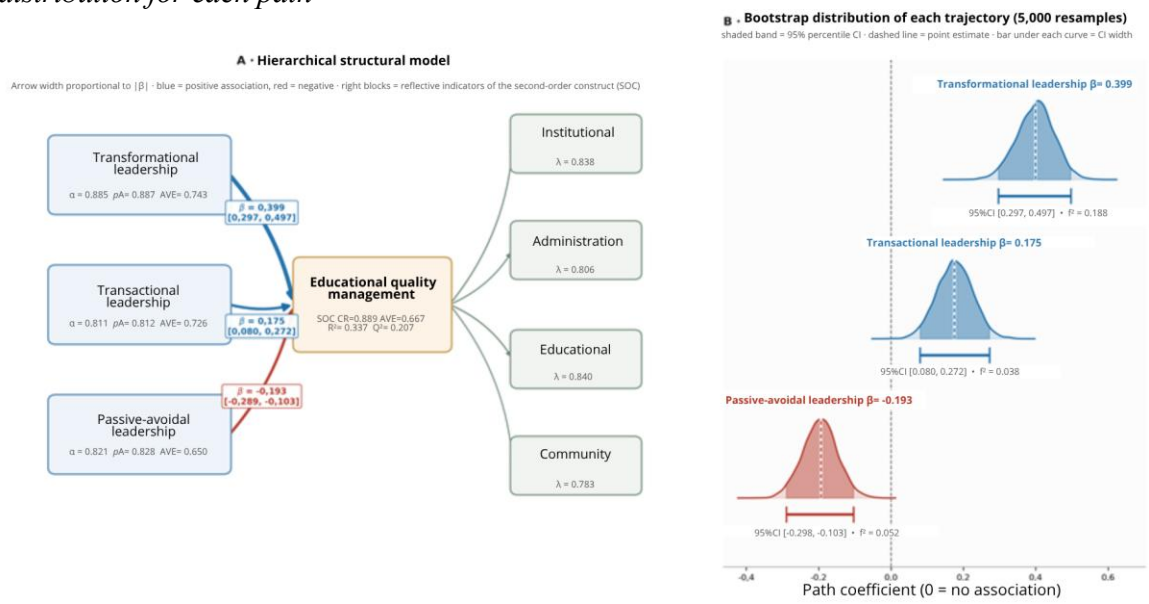


Figure 2. Hierarchical structural model of leadership and educational quality management, with the bootstrap distribution for each path (N = 301). Panel A: the three styles in the full-range model are modelled as distinct exogenous latent constructs, and educational quality management as a reflective-reflective second-order construct comprising its four dimensions (loadings 0.783–0.840). The width of the arrow is proportional to |β|; blue denotes a positive association and red a negative one. Panel B: kernel density plot of the 5,000 bootstrap resamples for each path coefficient; the shaded band represents the 95% confidence interval by percentiles and the dashed line represents the point estimate. Transformational leadership β = 0.399, 95% CI [0.297, 0.497], f^2 = 0.188; transactional leadership β = 0.175, 95% CI [0.080, 0.272], f^2 = 0.038; passive-avoidant β = −0.193, 95% CI [−0.289, −0.103], f^2 = 0.052. The model explains R^2 = 0.337 of the variance in the second-order construct, with Q^2 = 0.207. Note: the coefficients are estimated using partial least squares on cross-sectional data and indicate association, not causal effect; all three intervals exclude zero.

Explanatory power, predictive relevance and model fit

Table 9 reports the model evaluation. The structural model accounts for 33.7 per cent of the variance in educational quality management (R^2 = 0.337; adjusted R^2 = 0.330) and the Q^2 statistic obtained by blindfolding with an omission distance of seven is above zero. In PLSpredict with 10-fold cross-validation, the Q2predict statistic is positive for all four indicators of the higher-order construct, whilst the root mean square error of the linear reference model is lower than that of the PLS model in all four cases. The SRMR falls below the threshold of 0.08 in both stages, and the standardised goodness-of-fit index reaches 0.9752 and 0.9655 respectively. The d_ULS discrepancy is reported without a cut-off point.

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Table 9. *Model evaluation: explanatory power, predictive relevance and approximate fit*

Block	Statistic	Value / Q2predict	PLS RMSE	RMSE ML
Explanatory power	R^2 for educational quality management	0.337		
Explanatory power	Adjusted R^2	0.330		
Predictive power	Q2 (blindfolding, D = 7)	0.207		
Out-of-sample prediction	Q2predict / RMSE — INQ	0.108	0.944	0.887
Out-of-sample prediction	Q2predict / RMSE — ADQ	0.021	0.990	0.947
Out-of-sample prediction	Q2predict / RMSE — PEQ	0.167	0.912	0.875
Out-of-sample prediction	Q2predict / RMSE — COQ	0.081	0.959	0.921
Approximate adjustment	SRMR (stage 1 / stage 2)	0.0528 / 0.0650		
Approximate adjustment	d_ULS (stage 1 / stage 2)	0.7704 / 0.4434		
Approximate adjustment	NFI (stage 1 / stage 2)	0.9752 / 0.9655		

Note: RMSE = root mean square error; ML = linear reference model; SRMR = standardised residual mean square root; NFI = normalised fit index; INQ = institutional quality; ADQ = administrative quality; PEQ = pedagogical quality; COQ = community quality. PLSpredict with 10-fold cross-validation. SRMR is reported against a threshold of 0.08; d_ULS and NFI are reported without a cut-off point. N = 301.

Measurement invariance and multigroup analysis by informant role

Table 10 reports the assessment of invariance and the comparison of structural coefficients between school leaders (n = 35) and teachers (n = 266). The composite scores correlate between 0.876 and 0.973 across both groups, and neither the difference in means nor that in variances exceeds 0.42 in absolute value on the standardised scale. The three path differences tested using permutation analysis with 2,000 permutations do not reach the .05 significance level. The R^2 for educational quality management is 0.433 in the headteachers' group and 0.332 in the teachers' group.

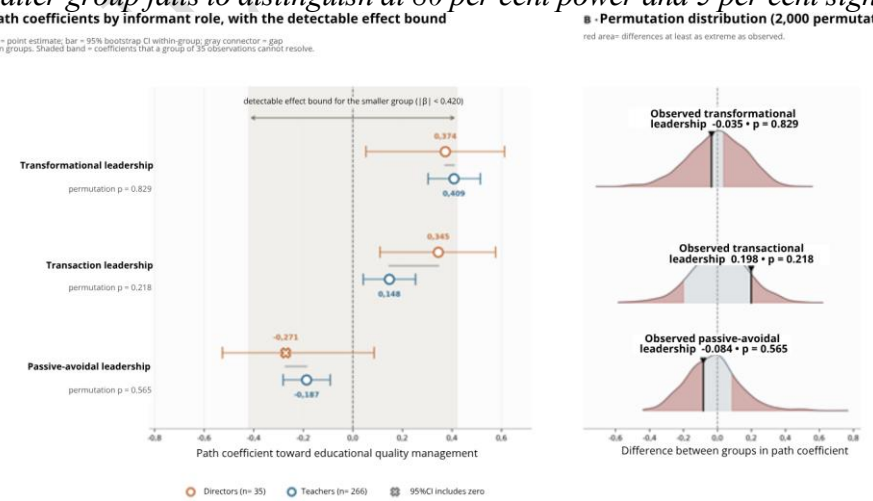
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Table 10. *Measurement invariance and multigroup analysis by informant role (school leaders n = 35; teachers n = 266)*

Statistic	Managers / c-value	Teachers / difference in means	Difference / difference in variances	p (permutation)
Measurement invariance — Transformational leadership	0.941	-0.068	0.185	
Measurement invariance — Transactional leadership	0.876	0.367	-0.096	
Measurement invariance — Passive-avoidant leadership	0.971	-0.179	0.278	
Measurement invariance — Educational quality management (COS)	0.973	0.134	0.420	
Group difference — Transformational leadership → quality management	0.374	0.409	-0.035	0.829
Group difference — Transactional leadership → quality management	0.345	0.148	0.198	0.218
Group difference — Passive-avoidant leadership → quality management	-0.271	-0.187	-0.084	0.565
R^2 for educational quality management	0.433	0.332	0.102	

Note: COS = higher-order construct. Rows 1–4 report the invariance analysis (correlation of composite scores and differences in means and variances between groups). Rows 5–7 report the permutation test of the path coefficients (2,000 permutations). No difference reaches the .05 level. School leaders n = 35; teachers n = 266.

Figure 3. *Displays this comparison alongside the range of coefficients that the smaller group fails to distinguish at 80 per cent power and 5 per cent significance*



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Figure 3. Comparison of structural coefficients between informant roles (school leaders n = 35; teachers n = 266). Panel A: point estimate and 95% bootstrap confidence interval for each path within each group, linked by the inter-group connector. The shaded band encompasses the coefficients that a group of 35 observations cannot detect with 80 per cent power at the 5 per cent significance level ($|\beta| < 0.420$); a cross indicates an interval that includes zero. Panel B: permutation distribution of the difference between groups (2,000 permutations), with the observed difference highlighted; the red area covers differences at least as extreme as the one observed. None of the three differences reaches the 0.05 level ($p = 0.829$; 0.218 and 0.565 for the transformational, transactional and passive-avoidant trajectories). Note: within the smaller group, the confidence interval for the passive-avoidant trajectory includes zero, so the absence of a difference between groups is evidence against a large difference and not evidence of exact equivalence.

Summary of the hypothesis testing

All three hypotheses were supported. The confidence interval for each trajectory coefficient excludes zero, and the sign of each coefficient is consistent with the direction specified a priori. The relative order of magnitudes also matches that stated in H2: the transformational coefficient exceeds the transactional one by a factor of 2.3. The effect sizes qualify this result, as only the transformational trajectory achieves a moderate f2, whilst the passive-avoidant and transactional trajectories fall within the small range.

Discussion

The asymmetry between leadership styles

The most puzzling finding is not that transformational leadership tops the estimated associations, but that the *absence* of directive behaviour is associated with quality management to an extent equivalent to—and of the opposite sign to—that of the transactional style (beta = -0.193 versus 0.175). The passive-avoidant style does not behave as the lower end of a continuum of leadership intensity, but rather as an organisational condition in its own right. This interpretation is overlooked in designs that measure leadership as a single quantity rather than as a repertoire, and it has an immediate consequence on the way in which institutions are assessed: an intermediate overall score may conceal either moderate and consistent leadership or the coexistence of transformational leadership in some dimensions and directive withdrawal in others—configurations which the evidence reported here suggests are associated with different levels of quality management. Notably, the literature on mechanisms has tended to model positive mediational chains. Significant indirect effects of school leadership on instructional practices are reported via collective teacher efficacy, with uncertainty avoidance acting as a moderator (Özdemir et al., 2023), and this mediation is replicated by adding school climate as a moderator of both the direct and indirect relationships (Alanoglu et al., 2026). Both studies are

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consistent with the positive association estimated here for transformational leadership, but neither models 'managerial omission' as a predictor with its own variance. In contrast to this tradition, the present finding suggests that the omitted term is not neutral: what the manager fails to do is associated with quality processes to a degree comparable, in magnitude, to what they do through contingent rewards.

The fact that the transformational style shows the strongest association (beta = 0.399, $f^2 = 0.188$) is consistent with the accumulated evidence. The transformational component achieves r = .569 compared with r = .265 for the transactional component in the meta-analytic synthesis that prompted this specification (Kasalak et al., 2022), and the estimates obtained here preserve this ranking; variance-based models applied to leadership styles and teacher performance also document that these styles differ rather than converge (Saleem et al., 2020).

From a critical perspective, however, directional agreement should not be interpreted as substantive convergence. A review of the evidence derived from TALIS warns that school leadership appears to be intertwined with institutional-level conditions, the omission of which inflates or depresses the associations observed depending on the design (Ahn et al., 2023); the R^2 obtained here is consistent with that warning rather than with a saturated model, and it is precisely this consistency that prevents the transformational coefficient from being interpreted as an estimate of the scope for improvement available to a specific institution. In the same vein, educational innovation requires a reconceptualisation of school leadership in terms of organisational change rather than individual attributes (Campbell et al., 2026), and managerial leadership behaviour is linked to innovation in a manner that depends on the available management conditions (Ngozi and Chinyere, 2024). A combined reading of these studies with the present findings suggests that the small transactional coefficient (f2 = 0.038) does not indicate that contingent rewards are irrelevant, but rather that their contribution operates on a different level—that of verifiable compliance—from that on which transformational behaviours operate, which is the level of the conditions that sustain processes over time. This interpretation is consistent with the logic of augmentation in the full-range model, according to which transformational behaviour is added to transactional behaviour rather than replacing it, and with the thesis that the management of school quality depends on the deliberate development of leaders and not solely on the supervision of performance (Manami, 2024).

From a critical perspective, a second interpretation of the same pattern is possible. If transactional behaviour and passive-avoidant behaviour exhibit comparable magnitudes and opposite signs, the distinction between an institution with poor leadership and one with merely adequate leadership does not lie in the intensity of control, but in its presence or absence. This observation shifts the focus of intervention: the aim would not be to scale up supervision where it already exists, but rather to identify those dimensions—institutional, administrative, pedagogical or community-based—in which managerial decision-making fails to take place. The model estimated here does not pinpoint these dimensions, because quality management is specified as a higher-order construct and the loadings of its four dimensions are homogeneous; identifying where the absence of managerial decision-making is concentrated would require a model with four separate

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outcomes, a natural extension of the present specification rather than an alternative to it. The available evidence suggests that such an extension would be informative, given that the organisational conditions underpinning each dimension differ from one another.

What the evaluation of the measurement model contributes

The results of the measurement model are not preliminary data: they form part of the findings. Reporting three reliability coefficients, the extracted mean variance and two independent criteria of discriminant validity establishes that the seven constructs are internally consistent and empirically distinguishable before any association between them is interpreted. The highest HTMT ratio of the 21 pairs remains well below the criterion, and the Fornell–Larcker criterion is met for all constructs. Without this evidence, an association between two summed scores could not be distinguished from a common-measure artefact, and any substantive discussion would lack a basis. The assessment of total collinearity is relevant for the same reason: the four variance inflation factors falling below the criterion suggest that the model is not governed by common-method variance, a plausible concern in any design where the same respondent reports on both predictor and outcome. The link between academic supervision and headteachers' managerial skills, on the one hand, and teaching quality and job effectiveness, on the other (Coronel 2023, 2024), illustrates an area in which such caution is particularly warranted, given that both ends of the relationship are usually reported by the same source and using the same instrument.

Informant roles and invariance

School leaders and teachers observe school leadership from structurally distinct positions, and a reasonable objection to any single-model estimation is that the two groups may be reporting on different objects. The multi-group comparison directly addresses this objection: none of the three path differences reaches the .05 significance level, meaning that the structural relationships hold across the informant roles and the clustered model is interpretable for both groups. This result takes on greater significance when contrasted with regional evidence, which documents associations estimated separately within each group or in composite samples without verification of equivalence: the relationship between headteacher leadership and institutional climate in a rural Peruvian educational network (Sánchez and Cueva, 2025); the case study on educational leadership and school climate in a Chilean state school (Carrasco et al., 2025), the link between headteacher leadership and teacher performance (Arias, 2023), the relationship between headteacher performance and reflective teaching practice (Varillas, 2025) and the analysis of transformational leadership's impact on institutional climate and teacher performance (Quispe et al., 2023). What the present evaluation adds to this body of work is not an additional association, but rather that the equivalence between roles is tested rather than assumed, and that the conclusion is stated within its limitations: given the size of the subgroup of headteachers, the absence of a

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significant difference is evidence against a large difference, not evidence of exact equivalence.

Explanatory scope and predictive limits

The model accounts for 33.7 per cent of the variance in educational quality management and exhibits predictive relevance according to the blindfolding criterion. The study's second anomaly arises here and is reported without qualification: in PLSpredict, the linear reference model achieved a lower root mean square error than the PLS model across all four indicators of the higher-order construct. This qualifies the predictive claim—the model is explanatorily informative and possesses predictive relevance in the sense of blindfolding, but does not outperform a naive benchmark in point prediction outside the sample—and identifies a specific direction for further development: the incorporation of institutional-level covariates absent from the current specification. The available evidence points to plausible candidates, including the impact of pedagogical leadership on educational innovation (Simanca, 2026)—a channel not represented in the current model—and the school-level conditions identified in the review of international evidence. Reporting this limitation rather than omitting it is precisely the purpose of predictive evaluation.

Contribution

Beyond the estimates, the contribution of this study lies in its specification and reporting framework. Modelling full-range styles as distinct exogenous constructs, treating the management of quality as a higher-order reflective-reflective construct built upon its four dimensions, and reporting the complete evaluation of the measurement model prior to any structural interpretation, together constitute a template that can be transferred to any scenario in which these instruments are applied. The evidence reported here comes from a district within the Peruvian basic education system; the specification is not specific to that district.

Limitations

The design is cross-sectional and correlational: the coefficients quantify associations at a single point in time and do not permit causal or directional claims, for which a longitudinal or quasi-experimental design would be required. The sample is a convenience sample comprising institutions that were accessible during the fieldwork; consequently, statistical inference is conditional on the sample obtained, and no claim is made regarding the representativeness of the population. All measures are self-reported by a single respondent per item; although the assessment of total collinearity showed no evidence of common-method bias, this procedure mitigates the concern rather than eliminating it, and the inclusion of an independent quality management indicator would strengthen future estimates. The subgroup of managers limits the power of the multi-group comparison, which, within that subgroup, detects differences in career trajectory of a magnitude of 0.420

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or greater. Finally, the out-of-sample prediction assessment did not favour the model over the linear reference model: the explanatory interpretation of the model is supported, whilst its predictive interpretation is limited.

Conclusions

Managerial leadership is associated with the management of educational quality in basic education institutions, but the association is not uniform across leadership styles. Transformational leadership shows the strongest positive association (beta = 0.399, 95% CI [0.297, 0.497]), passive-avoidant leadership shows a negative association of intermediate magnitude (beta = -0.193, 95% CI [-0.289, -0.103]), and transactional leadership shows a positive association of lesser magnitude (beta = 0.175, 95% CI [0.080, 0.272]). Together, these account for 33.7% of the variance in quality management.

The instruments used meet the established criteria for internal consistency, convergent validity and discriminant validity, and the model shows no evidence of common-method bias. The structural relationships hold across both school leaders and teachers, subject to the power limitations imposed by the size of the leadership subgroup.

Two practical implications arise from the pattern as a whole rather than from any single coefficient. The first is that interventions targeting headteachers' leadership are more likely to be associated with improvements in quality management when they foster transformational behaviour than when they merely reinforce supervision and contingent rewards. The second is that the negative coefficient for the passive-avoidant style indicates that the absence of leadership behaviour constitutes in itself an organisational condition that warrants measurement and attention, rather than merely a low score on a continuum of intensity. As this is a cross-sectional design, both implications are presented as associations that warrant longitudinal examination, rather than as established effects.

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