RELATIONSHIP BETWEEN DIGITAL LEADERSHIP AND SCHOOL MANAGEMENT EFFECTIVENESS IN PUBLIC PRIMARY AND JUNIOR SECONDARY SCHOOLS IN LICANG DISTRICT, QINGDAO, CHINA

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ABSTRACT
This research examined the relationships between school principals' Digital Leadership and School Management Effectiveness in public primary and junior secondary schools in Licang District, Qingdao, China. A quantitative cross-sectional correlational survey involved 264 teachers (148 primary-school and 116 junior-secondary-school teachers). Descriptive statistics, Pearson's product-moment correlations, and internal-consistency analyses were employed. Overall Digital Leadership ($M = 3.85$, $SD = .52$) and School Management Effectiveness ($M = 3.80$, $SD = .47$) were perceived at high levels. Overall Digital Leadership was positively correlated with School Management Effectiveness ($r = .401$, $p < .001$). Its three dimensions were also positively correlated with School Management Effectiveness: Support, Encouragement, and Motivation for Digitalization ($r = .359$, $p < .001$); Problem-Solving in Digitalization ($r = .121$, $p = .049$); and ICT Support and Resources ($r = .315$, $p < .001$). Cronbach's alpha was .834 for the final 20-item leadership scale and .769 for the final 22-item management scale. Findings concern unadjusted statistical associations, not independent predictive effects or causal relationships. This study concludes with implications for principal development, ICT support, and school management improvement.
Keywords: Digital Leadership, School Management Effectiveness, Public Schools, Educational Administration, Qingdao

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INTRODUCTION

Digital transformation has recently become an important development in educational administration. Artificial intelligence, digital platforms, learning management systems, data-based tools, and online communication systems are increasingly integrated not only into teaching and learning but also into school planning, professional development, resource coordination, communication, and decision-making. Consequently, school digitalization cannot be considered simply as a matter of providing technological equipment. It also requires leadership that can connect digital resources with educational goals, organizational processes, and teachers' professional work. Avolio et al. (2000) explained that e-leadership is a social influence process embedded in advanced information technology, while Okunlola et al. (2024) emphasized that digital leadership is associated with organizational collaboration, performance, and effectiveness. In the school context, principals are therefore required to create the conditions in which technology can be translated into meaningful educational and administrative practice.

Digital Leadership in this study refers to the ability and practices of the school principal to support, promote, and facilitate the effective use of digital technologies in school management and educational activities. It is broader than the principal's personal ability to operate digital devices. Rather, it includes Support, Encouragement, and Motivation for Digitalization; Problem-Solving in Digitalization; and ICT Support and Resources. Tahir et al. (2025) validated a multidimensional digital leadership instrument for school principals, while Chaw et al. (2024) similarly demonstrated that technology leadership should be represented through observable organizational practices rather than personal technological proficiency alone. In China, Wu et al. (2019) found that principal e-leadership contributed significantly to ICT transformation across different stages of K-12 education in Shanghai, showing the relevance of leadership for technology-related organizational change.

School Management Effectiveness is another important concern in Educational Administration. School Effectiveness is a broad concept that can include student achievement, school climate, instructional quality, leadership, and organizational conditions (Javornik & Klemenčič Mirazchiyski, 2023; Scheerens & Creemers, 1989). The present research adopts a management-oriented focus and defines School Management Effectiveness as the extent to which major management and administrative processes are effectively implemented to support organizational and educational goals. Four areas are emphasized: Academic Administration, Budget Administration, Personnel Administration, and General Administration. These areas represent major functions through which schools organize curriculum and teaching, allocate financial and material resources, develop personnel, manage information and facilities, and coordinate relationships with parents and community stakeholders.

Previous studies provide a reasonable basis for expecting Digital Leadership to be related to School Management Effectiveness. Studies in Thai educational settings reported significant positive relationships between administrators' Digital Leadership and School Effectiveness (Boonlertrit & Nak-Ai, 2023; Phonkhan & Wichitputchraporn, 2025; Rordkong & Thaima, 2025). In addition, Tinnarach and Prasansaph (2024) found that information technological leadership was positively related to Academic Administration Effectiveness. Chinese evidence also indicates that principal leadership is related to ICT transformation, professional learning, and educational outcomes (Liu & Hallinger, 2018; Wu et al., 2019; Wu & Shen, 2022). However, limited research has directly examined teachers' perceptions of the relationship between school principals' Digital Leadership and School Management Effectiveness in public primary and junior secondary schools in Licang District, Qingdao. The present study therefore focuses on this specific relationship within one district-level public-school context. Chen and Kouhsari (2025) also showed that leadership and social support are relevant to school digital transformation in Chinese public schools, while Yuan et al. (2026) demonstrated that principals

may adopt different leadership orientations according to institutional, cultural, technological, and resource conditions. Zhong et al. (2026) further reported that leadership structures and their associations with school outcomes can differ between elementary and secondary schools in China. These findings reinforce the need for localized evidence across school stages.

This research aims at studying the levels of school principals' Digital Leadership and School Management Effectiveness and examining the relationship between overall Digital Leadership, its three dimensions, and School Management Effectiveness in public primary and junior secondary schools in Licang District, Qingdao, China, as perceived by teachers.

LITERATURE REVIEWS

Relationship between Digital Leadership and School Management Effectiveness

Transformational Leadership Theory and the e-leadership perspective provide important foundations for explaining Digital Leadership. Burns (1978) proposed that transformational leadership elevates followers' motivation and purpose, while Bass and Riggio (2006) emphasized inspirational motivation, intellectual stimulation, individualized consideration, and idealized influence. These principles are applicable to school digitalization because principals must communicate the purpose of digital change, support teachers with different levels of confidence, and encourage problem-solving when digital initiatives create unfamiliar challenges. Berkovich and Hassan (2025) further showed that digital transformational leadership is linked with teacher commitment and perceived school effectiveness, supporting the continuing importance of motivational and relational leadership in technology-rich school environments.

The e-leadership perspective adds that technology and leadership influence one another. Avolio et al. (2000) argued that technology can alter the channels, timing, reach, and structure of leadership interaction. In schools, principals increasingly communicate, plan, monitor, coordinate, and support professional work through digital platforms and information systems. AlAjmi (2022) found that digital leadership was positively associated with teachers' technology integration, while Dasruth et al. (2024) emphasized supportive communication and capacity building in principals' digital leadership practices. These studies indicate that effective Digital Leadership combines human support with the organizational use of technology.

School Management Effectiveness reflects how effectively schools implement their core administrative functions. Academic Administration concerns planning, curriculum implementation, supervision, assessment, and instructional support. Budget Administration concerns the allocation, utilization, monitoring, transparency, and accountability of financial and material resources. Personnel Administration concerns role allocation, professional development, participation, performance support, and effective use of staff expertise. General Administration concerns information management, facilities, communication, student support, the school environment, and cooperation with parents and community stakeholders. Tiwthong et al. (2025) emphasized the contribution of administrators' competencies to school administration effectiveness, while the broader school-effectiveness literature views leadership and organizational processes as important conditions associated with effective schools (Javornik & Klemenčič Mirazchiyski, 2023).

Evidence concerning the four administrative areas also supports the management-oriented conceptualization used in this study. Kanyasakul et al. (2023) examined the effectiveness of academic management, while Pansupa and Pumipuntu (2022) reported that budget administration was associated with school effectiveness. Lamatokan et al. (2024) emphasized school transparency and principal competence in effective budget management. Yuennan and Tonwimonrat (2024) connected personnel management with school effectiveness, and Pimsi et al. (2025) linked administrators' organizational communication with General Administration

Effectiveness. These studies show that school management effectiveness can be meaningfully examined through distinct but connected administrative domains.

Empirical studies have repeatedly reported positive links between technology-related leadership and school outcomes. Boonlertrit and Nak-Ai (2023) reported a significant positive relationship between Digital Leadership and School Effectiveness. Phonkhan and Wichitputchraporn (2025) similarly found a statistically significant high positive relationship using teacher ratings. Rordkong and Thaima (2025) found that Digital Leadership was strongly and positively related to School Effectiveness. In China, Wu et al. (2019) found that principal e-leadership significantly contributed to ICT transformation across school stages. Although the outcome variables in these studies are not identical to School Management Effectiveness, their findings consistently support the expectation that stronger Digital Leadership is associated with stronger organizational functioning. Accordingly, the following hypothesis was derived for this study:

H1: School principals' overall Digital Leadership is significantly and positively related to School Management Effectiveness in public primary and junior secondary schools in Licang District, Qingdao, China, as perceived by teachers.

Relationships between Digital Leadership Dimensions and School Management Effectiveness

Support, Encouragement, and Motivation for Digitalization represents the relational and motivational side of Digital Leadership. Principals create an enabling environment when they communicate the importance of digitalization, recognize teachers' efforts, provide guidance, create professional-sharing opportunities, and support experimentation with appropriate digital tools. This dimension is consistent with individualized consideration and inspirational motivation in transformational leadership. Zeng et al. (2025) identified supportive culture, professional development, learning communities, infrastructure, and resource allocation as leadership-enabled conditions for teachers' digital and artificial-intelligence competency. Promwungkhwa et al. (2025) also found that Digital Leadership was significantly associated with teacher work motivation. These findings suggest that supportive leadership can be connected with broader organizational and management effectiveness because teacher participation is a necessary condition for implementing school priorities.

Problem-Solving in Digitalization concerns the principal's ability to identify problems, coordinate relevant personnel, seek practical solutions, consider staff and student readiness, and adjust implementation arrangements when existing approaches do not work as planned. Digital transformation frequently creates technical and organizational problems involving systems, access, communication, procedures, workload, and alignment between technology and actual school needs. Intellectual stimulation in transformational leadership and the technology-mediated leadership perspective both suggest that leaders must treat such difficulties as opportunities for collaborative adjustment rather than as reasons to discontinue digital initiatives. The effectiveness of this dimension may therefore be reflected in the school's capacity to maintain administrative continuity and to adapt its management processes during technological change.

ICT Support and Resources refers to facilitating access to ICT equipment, digital platforms, software, technical assistance, training opportunities, maintenance, and follow-up support. Chaw et al. (2024) emphasized the organizational-support dimension of technology leadership, while AlAjmi (2022) indicated that leadership support is associated with technology integration. Resource provision is also relevant to School Management Effectiveness because academic, personnel, budget, and general administration increasingly depend on reliable information systems, communication platforms, and digitally supported work processes. Resource availability alone, however, is insufficient; leadership must ensure that digital resources are reasonably matched with instructional and management needs.

Taken together, the literature provides grounds for examining whether the three Digital Leadership dimensions have positive bivariate associations with School Management Effectiveness. Supportive leadership concerns people and motivation, problem-solving concerns adaptive coordination, and ICT support concerns enabling conditions. Previous studies report correlations between technology-related leadership and school outcomes, although the measures and contexts differ (Niljullaka et al., 2025; Rordkong & Thaima, 2025). The present study describes the overall correlation and each dimension's separate zero-order relationship with School Management Effectiveness. It does not test whether any dimension makes a unique contribution after adjusting for the other dimensions. Accordingly, the following hypothesis was derived:

H2: The three dimensions of school principals' Digital Leadership, namely Support, Encouragement, and Motivation for Digitalization; Problem-Solving in Digitalization; and ICT Support and Resources, are each significantly and positively related to School Management Effectiveness.

The non-directional conceptual framework used to test these associations is presented in Figure 1.

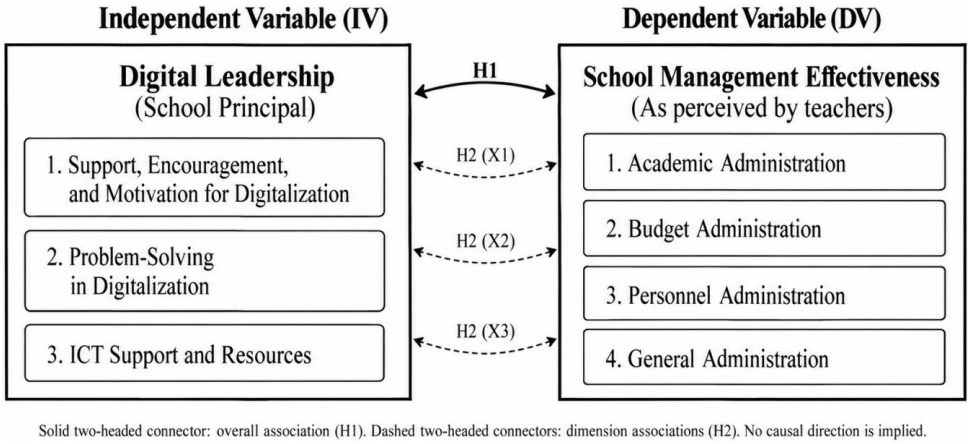

Figure 1 Conceptual framework informed by Tahir et al. (2025) and Scheerens and Creemers (1989). The solid two-headed curved connector denotes H1 (overall association), and the dashed two-headed curved connectors denote H2 (three separate dimension-level associations with overall School Management Effectiveness). The connections denote covariance/correlation only, not causal or regression paths.

RESEARCH METHODOLOGY

This study employed a quantitative, cross-sectional correlational design to examine teachers' perceptions of the relationships between Digital Leadership and School Management Effectiveness in selected public primary and junior secondary schools in Licang District, Qingdao, China. The accessible population consisted of 772 full-time teachers in eight participating public schools: 433 teachers from five public primary schools and 339 teachers from three public junior secondary schools. Using Yamane's (1973) formula at a 95% confidence level and a 5% allowable sampling error, the required sample was 264 teachers. Proportionate stratified random sampling by school level yielded 148 public primary-school teachers and 116 public junior-secondary-school teachers. This design was selected to quantify the direction, magnitude, and statistical significance of unadjusted associations, not to estimate unique predictors or causal effects.

A structured questionnaire was administered to collect the data. The first part included respondents' general information, namely gender, age, educational qualification, school level, teaching experience, and years of service in the current school. The second part measured

Digital Leadership through 20 items adapted from the instrument developed and validated by Tahir et al. (2025). The items represented Support, Encouragement, and Motivation for Digitalization (7 items), Problem-Solving in Digitalization (6 items), and ICT Support and Resources (7 items). The third part measured School Management Effectiveness through 22 items covering Academic Administration (5 items), Budget Administration (5 items), Personnel Administration (6 items), and General Administration (6 items). Parts two and three used a five-point rating scale from 1 meaning "Very Low" to 5 meaning "Very High."

The final analytic dataset contained 264 responses without missing values among the 42 questionnaire items. Frequency and percentage described respondent characteristics; means and standard deviations summarized the overall scales and their dimensions. Cronbach's alpha assessed internal consistency using the final 264 responses rather than an independently documented pilot sample. Pearson's product-moment correlation was used for H1 (overall Digital Leadership with overall School Management Effectiveness) and for H2 (each leadership dimension separately with the same overall management-effectiveness score). Each association was assessed at the originally specified two-sided $\alpha = .05$ threshold. Correlations among the three leadership dimensions were also displayed to make shared variance transparent. No multiple regression, partial correlation, or structural path model was estimated, so the analysis cannot determine whether any leadership dimension has a unique association conditional on the others. The study is observational and does not establish causal direction.

RESEARCH RESULTS

Instrument Reliability

Internal-consistency reliability was assessed for the final administered 42-item questionnaire using responses from all 264 teachers. Cronbach's alpha was .834 for overall Digital Leadership and .769 for overall School Management Effectiveness. The three Digital Leadership dimensions had alpha coefficients from .845 to .861, while the four School Management Effectiveness dimensions had coefficients from .830 to .876 (Table 1). All coefficients exceeded .70.

Table 1 Internal-Consistency Reliability of the Final Questionnaire (n = 264)

Scale / dimension	Items	Cronbach's α	Details
Digital Leadership, overall	20	0.834	Final n = 264
Support, Encouragement and Motivation	7	0.845	SEMD
Problem-Solving in Digitalization	6	0.861	PSD
ICT Support and Resources	7	0.856	ICTSR
School Management Effectiveness, overall	22	0.769	Final n = 264
Academic Administration	5	0.830	AA
Budget Administration	5	0.876	BA
Personnel Administration	6	0.843	PA
General Administration	6	0.855	GA

Note: Cronbach's α was calculated using the final 264 valid questionnaires (20 Digital Leadership items and 22 School Management Effectiveness items). These are main-sample internal-consistency coefficients, not independent pilot-test results.

Respondents' Profiles and Studied Variables

A total of 264 valid questionnaires were analyzed. The respondents were almost equally distributed by gender, with 131 males (49.62%) and 133 females (50.38%). The largest age group was 31-40 years old (93 persons, or 35.23%), followed by 41-50 years old (84 persons, or 31.82%). In terms of educational qualification, 114 respondents (43.18%) held a bachelor's degree, 81 (30.68%) held a master's degree, 49 (18.56%) held a doctoral degree, and 20

(7.58%) reported other qualifications. Concerning school level, 148 teachers (56.06%) were from public primary schools and 116 (43.94%) were from public junior secondary schools. The largest group had 6-10 years of total teaching experience (112 persons, or 42.42%), and most respondents had served in their current school for 4-6 years (111 persons, or 42.05%).

Digital Leadership and School Management Effectiveness

Table 2 displays the mean, standard deviation, and interpretation of the studied variables. The five-level interpretation followed the criteria applied in the thesis: 4.21-5.00 = Very High, 3.41-4.20 = High, 2.61-3.40 = Moderate, 1.81-2.60 = Low, and 1.00-1.80 = Very Low. The findings addressed that teachers perceived both Digital Leadership and School Management Effectiveness at high levels. Among the Digital Leadership dimensions, Support, Encouragement, and Motivation for Digitalization obtained the highest mean, while Problem-Solving in Digitalization obtained the lowest mean. Among the School Management Effectiveness dimensions, Academic Administration and Personnel Administration recorded the highest rounded means, whereas Budget Administration obtained the lowest mean and the largest standard deviation.

Table 2 Mean, Standard Deviation and Interpretation of Related Variables

Variables	M	SD	Level
Digital Leadership			
Support, Encouragement, and Motivation for Digitalization	3.94	.72	High
Problem-Solving in Digitalization	3.76	.85	High
ICT Support and Resources	3.84	.80	High
Overall Digital Leadership	3.85	.52	High
School Management Effectiveness			
Academic Administration	3.84	.84	High
Budget Administration	3.76	1.10	High
Personnel Administration	3.84	.79	High
General Administration	3.78	.83	High
Overall School Management Effectiveness	3.80	.47	High

Note: The interpretation is based on the five-level mean-score criteria used in the study.

From Table 2, the overall level of Digital Leadership was high (M = 3.85, SD = .52). Support, Encouragement, and Motivation for Digitalization had the highest mean (M = 3.94, SD = .72), followed by ICT Support and Resources (M = 3.84, SD = .80), while Problem-Solving in Digitalization had the lowest mean (M = 3.76, SD = .85). The overall level of School Management Effectiveness was also high (M = 3.80, SD = .47). Academic Administration (M = 3.84, SD = .84) and Personnel Administration (M = 3.84, SD = .79) were the highest-rated dimensions after rounding, followed by General Administration (M = 3.78, SD = .83), while Budget Administration had the lowest mean (M = 3.76, SD = 1.10).

Zero-Order Pearson Correlations and Hypothesis Analysis

Pearson's product-moment correlations were calculated for the two research hypotheses. Overall Digital Leadership was positively associated with School Management Effectiveness ($r = .401$, $p < .001$), providing support for H1. Support, Encouragement, and Motivation for Digitalization ($r = .359$, $p < .001$), Problem-Solving in Digitalization ($r = .121$, $p = .049$), and ICT Support and Resources ($r = .315$, $p < .001$) each had positive zero-order associations with the same overall School Management Effectiveness score. Thus, all three H2 relationships met the original unadjusted .05 criterion. However, the evidence for problem-solving was

comparatively weak and close to the significance cutoff. Since all coefficients are zero-order correlations, no coefficient measures a dimension's separate contribution after accounting for the other two dimensions.

Table 3 Pearson Zero-Order Correlation Matrix among Leadership Dimensions and Overall School Management Effectiveness (n = 264)

Variables	SEMD	PSD	ICTSR	SME
SEMD	-			
PSD	.064	-		
ICTSR	.261***	.152*	-	
SME	.359***	.121*	.315***	-

Note: SEMD = Support, Encouragement, and Motivation for Digitalization; PSD = Problem-Solving in Digitalization; ICTSR = ICT Support and Resources; SME = School Management Effectiveness. * $p < .05$; *** $p < .001$. Cross-dimension correlations are also shown to document shared variation.

Table 4 Hypothesis Testing: Prespecified Bivariate Pearson Correlations (n = 264)

Hypothesis / Relationship	r	p-value	Result
H1: Overall DL ↔ SME	.401	< .001	Supported
H2a: SEMD ↔ SME	.359	< .001	Supported
H2b: PSD ↔ SME	.121	.049	Supported
H2c: ICTSR ↔ SME	.315	< .001	Supported

Note: DL = overall Digital Leadership; SME = overall School Management Effectiveness. H2a-H2c are three components of H2 and refer to separate, unadjusted Pearson correlations. 'Supported' refers to the original $\alpha = .05$ rule and must not be interpreted as support for unique predictive effects.

Table 4 summarizes the prespecified hypothesis tests. The overall correlation supports H1 ($r = .401$, $p < .001$). The three H2 dimension-level associations are positive and meet the original unadjusted significance criterion, but differ substantially in magnitude: SEMD ($r = .359$), PSD ($r = .121$), and ICTSR ($r = .315$). The relatively small PSD correlation ($p = .049$) warrants particular caution. As a conservative sensitivity illustration, a Bonferroni adjustment for the three H2 comparisons sets the familywise threshold at $.05/3 = .0167$; under that threshold, PSD would not be statistically significant, whereas SEMD and ICTSR would remain significant. This adjustment is reported transparently as a sensitivity check, not as a retroactive change to the prespecified primary analysis. The observed intercorrelations among dimensions ($r = .064$-$.261$) indicate some shared variance. Bivariate correlations cannot separate their unique associations with SME.

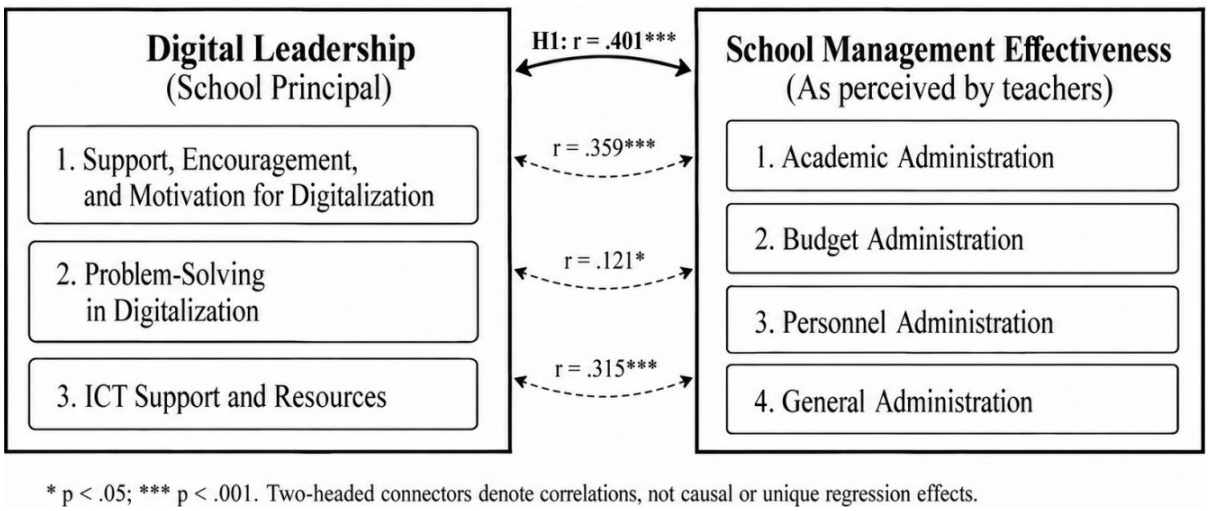

Figure 2 Observed zero-order Pearson correlations (n = 264). Double-headed curved connectors denote non-directional statistical associations. These are not unique predictive or causal effects. * $p < .05$; *** $p < .001$.

DISCUSSION & CONCLUSION

This study examined the levels of perceived Digital Leadership and School Management Effectiveness and their zero-order relationships among 264 teachers in Licang District. Both overall constructs were rated at high levels, and the overall correlation was moderate and positive ($r = .401$, $p < .001$). The two overall measures exhibited internal-consistency coefficients of $\alpha = .834$ and $\alpha = .769$ in the final sample. All three dimensions of Digital Leadership showed positive bivariate associations with School Management Effectiveness, although the strength of the associations varied. The findings establish statistical co-variation in the surveyed teachers' perceptions, not causal links or separate predictive contributions of the leadership dimensions.

The high level of Digital Leadership suggests that digital leadership practices have become visible components of school administration in the participating schools. Support, Encouragement, and Motivation for Digitalization obtained the highest mean among the three dimensions. This result implies that teachers particularly recognized leadership behaviors involving encouragement, guidance, recognition, professional sharing, and the creation of a supportive environment for digital practice. The finding is consistent with the transformational-leadership perspective, which emphasizes motivation, individualized support, and intellectual stimulation (Bass & Riggio, 2006), and with Zeng et al. (2025), who identified supportive culture, professional development, learning communities, infrastructure, and resource allocation as leadership-enabled conditions for digital competency. It is also consistent with Wu et al. (2019), who demonstrated the contribution of principal e-leadership to ICT transformation in Chinese K-12 schools.

ICT Support and Resources was also perceived at a high level and showed a significant positive relationship with School Management Effectiveness. This indicates that equipment, digital platforms, software, technical assistance, training opportunities, maintenance, and follow-up support are not merely technical matters but parts of the organizational environment shaped by leadership. AlAjmi (2022) similarly found that Digital Leadership was positively associated with teachers' technology integration. For school management, the practical meaning is that digital resources need to be maintained, accessible, and appropriately matched with academic and administrative needs. District and school leaders should therefore view ICT support as an ongoing management system rather than a one-time provision of hardware.

Problem-Solving in Digitalization was rated high but had the lowest mean among the Digital Leadership dimensions ($M = 3.76$, $SD = .85$). Its correlation with School Management Effectiveness was positive but small ($r = .121$, $p = .049$), with a two-sided p value just below the originally prespecified .05 cutoff. Accordingly, this finding should not be described as a strong or practically important relationship. When a conservative Bonferroni correction is applied as a sensitivity check across the three H2 relationships, this particular association no longer meets the adjusted .0167 threshold. Reactive problem-solving might be less consistently visible to teachers than ongoing encouragement or ICT provision, but that interpretation remains speculative and would require additional research.

The high level of School Management Effectiveness indicates that teachers generally viewed the core administrative processes in their schools as functioning effectively. Academic Administration and Personnel Administration obtained the highest rounded means. The academic result suggests positive perceptions of planning, curriculum implementation, instructional support, assessment use, and academic review. This pattern is consistent with Tinnarach and Prasansaph (2024), who found a positive relationship between information technological leadership and academic-affairs administration effectiveness. Personnel Administration was also rated highly, suggesting comparatively positive perceptions of duty allocation, professional development, performance support, participation, and the alignment of staff expertise with organizational needs.

Budget Administration, although still perceived at a high level, obtained the lowest mean and the largest standard deviation among the four management dimensions. This finding indicates greater diversity in teachers' experiences or knowledge of financial and material-resource practices. Budget administration is important because digital transformation often requires continuing investment in infrastructure, platforms, maintenance, and staff development. Schools should therefore strengthen transparency, accountability, documentation, communication of resource priorities, and routine monitoring of financial and material resources. This recommendation is consistent with Lamatokan et al. (2024), who highlighted transparency and principal competence in budget management, and with Pansupa and Pumipuntu (2022), who linked budget administration with school effectiveness. General Administration should also continue to connect information management, facilities, communication, student support, and school-community cooperation with academic and personnel processes rather than treating these functions as isolated administrative activities.

The significant positive relationship between overall Digital Leadership and School Management Effectiveness ($r = .401$, $p < .001$) provides localized evidence consistent with previous educational research. Boonlertrit and Nak-Ai (2023), Phonkhan and Wichitputchraporn (2025), Rordkong and Thaima (2025), and Niljullaka et al. (2025) reported significant positive relationships between digital or technology-related leadership and school effectiveness in Thai educational settings. Wu et al. (2019) provided relevant Chinese evidence by linking principal e-leadership with ICT transformation. The present study extends this general pattern by focusing specifically on School Management Effectiveness and by examining both public primary and junior secondary schools in one district-level Chinese context. This inclusion is meaningful because Zhong et al. (2026) reported differences in the structure and effectiveness of principal leadership between elementary and secondary schools in China, while Yuan et al. (2026) emphasized the context-sensitive nature of principals' leadership for digital transformation. Although the current study did not test school-level differences, the combined sample provides a basis for future comparative analysis.

At the dimension level, Support, Encouragement, and Motivation for Digitalization had the largest zero-order correlation with School Management Effectiveness ($r = .359$), followed by ICT Support and Resources ($r = .315$). Problem-Solving in Digitalization was associated more weakly ($r = .121$). These are descriptive comparisons of separate bivariate coefficients; they

should not be interpreted as a ranking of independent causal importance or as evidence that the difference between correlations is statistically significant. The intercorrelations among dimensions are modest, but all three dimensions may share variance with school-management ratings. Because the study did not estimate a multivariable model, it cannot identify which leadership dimension has a statistically significant unique contribution after other dimensions are held constant. The results nonetheless describe useful patterns for future research and school-leadership reflection.

The study has limitations that are integral to its stated correlational scope. The design is cross-sectional, based on self-reported teacher ratings, and limited to selected schools in one district, so neither causal direction nor broad generalizability can be established. Separate Pearson coefficients do not control for the overlap among the three Digital Leadership dimensions or for unmeasured organizational factors. Cronbach's alpha coefficients were calculated from the final analytic sample, not from a separately documented pilot. Future studies may use multivariable methods, school-clustered or multilevel designs, multiple data sources, and longitudinal observations to test unique associations and temporal ordering.

In conclusion, teachers who reported stronger Digital Leadership also tended to report greater School Management Effectiveness in the sampled public schools. The positive overall correlation and the three positive dimension-level correlations answered the study's prespecified correlational questions. The problem-solving association was weak and should be interpreted cautiously, particularly under multiplicity-sensitive criteria. The findings may inform educational administration and future hypothesis development, but they do not demonstrate that any single leadership dimension independently predicts, or causes, more effective school management.

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