



Strengthening Transformational Leadership in Establishing Adaptive Educational Management in the Digital Era

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ABSTRACT

Digital transformation requires educational institutions to have responsive, innovative, and sustainable governance, but organizational adaptability is still influenced by leadership quality. This study aims to analyze the influence of transformational leadership on the formation of adaptive education management in the digital era. The study used an explanatory quantitative approach through a survey of 180 principals and teachers selected by proportional stratified random sampling. Data were collected using a Likert scale questionnaire and analyzed with Structural Equation Modeling based on Partial Least Squares. The results show that transformational leadership has a positive and significant effect on the adaptability of education management, especially through strengthening digital vision, human resource empowerment, innovation, and collaboration. These findings confirm that strengthening transformational leadership is an important strategy to increase the resilience, flexibility, and effectiveness of education management in the midst of technological change.

INTRODUCTION

Digital transformation has changed the management pattern of educational institutions, ranging from learning planning, organizational communication, human resource development, provision of academic services, to data-driven decision-making. These changes are increasingly intensified as artificial intelligence, learning analytics, learning management systems, and various digital collaboration platforms develop. However, digital transformation is not enough to be carried out through the procurement of devices and applications because its success is also determined by human readiness, organizational culture, governance, and the ability of institutions to respond to change in a sustainable manner. McCarthy et al. (2023) emphasized that the digital transformation of education is a systemic change that requires connectivity between people, data, leadership, and the organizational ecosystem. In the Indonesian context, Purnomo et al. (2024) also show that the formation of a digital-based school culture requires the management of planned changes, the development of digital vision, the strengthening of competencies, and the increase of technology acceptance by all school residents. This condition shows that educational institutions need management that is not only digitalized, but also adaptive to environmental changes.

Adaptive education management can be understood as the ability of educational institutions to recognize changes, adjust strategies, develop human resource competencies, allocate resources flexibly, and make improvements based on continuous evaluation. These abilities are inseparable from the role of leaders in building the direction of change and encouraging the involvement of organizational members. In this case, transformational leadership is relevant because it emphasizes ideal influence, inspirational motivation, intellectual stimulation, and individual attention. Through these dimensions, leaders can build a shared vision, increase the confidence of organizational members, encourage creativity, and empower teachers to be more active in facing change. Polatcan et al. (2023) found that the transformational leadership of school principals is related to increased teacher agency, especially through strengthening self-efficacy. Meanwhile, Ghamrawi and Tamim (2023) identified digital competence, digital culture, digital differentiation, digital governance, and digital advocacy as leadership attributes that support the adaptability of educational institutions to digitalization.

Previous empirical findings show that leadership quality plays an important role in the successful application of technology and changes in educational organizations. AlAjmi (2022), through a study of 113 principals and 404 primary school teachers in Kuwait, found that the digital leadership of school principals has a positive influence on the integration of technology by teachers. Furthermore, Berkovich and Hassan (2025), based on data from 380 teachers in Bahrain, show that the digital transformational leadership of school principals is related to the commitment of teacher organizations and the effectiveness of schools in the implementation of distance education. In the Indonesian context, Purnomo et al. (2024) found that changes towards a digital-based school culture take place through several stages, including the formation of change teams, the

provision of digital resources, the development of digital vision and skills, the handling of obstacles, short-term achievements, and the increase in technology acceptance. These results show that the success of digital transformation is determined more by the leader's ability to move people and cultural change than simply the availability of technology.

Nonetheless, previous research still shows a number of scientific gaps. First, most research focuses more on digital leadership, technology integration, digital culture, teacher commitment, or school effectiveness, while adaptive education management has not been widely placed as the main construct influenced by transformational leadership. Second, Jameson et al. (2022), through a systematic review of digital leadership research in higher education, found that the field still has limitations in conceptual clarity, theoretical maturity, quality of empirical evidence, and consistency of research methods. Third, some studies were conducted in the context of a pandemic, distance education, one country, or one institution so that the results did not fully explain the need for educational institutions to adapt in the face of sustainable digital change. Ghamrawi and Tamim's (2023) research, for example, provides an in-depth understanding of digital leadership attributes, but only involved six members of the leadership team at one university. Therefore, quantitative testing is still needed to explain more broadly the influence of transformational leadership on the formation of adaptive education management.

Based on these gaps, this study aims to analyze the influence of transformational leadership on the formation of adaptive education management in the digital era. Transformational leadership is analyzed through the leader's ability to build a digital vision, provide inspirational motivation, conduct intellectual stimulation, provide individual attention, empower human resources, and encourage innovation and collaboration. Meanwhile, adaptive education management is reviewed through management flexibility, responsiveness to change, data-driven decision-making, organizational learning, and the ability to integrate technology in a sustainable manner. The study used an explanatory quantitative approach through a survey of 180 principals and teachers who were selected using the proportional random sampling technique. Data were collected using a Likert scale questionnaire and analyzed through Structural Equation Modeling-Partial Least Squares to test the relationships between constructs simultaneously.

Theoretically, this research is expected to expand the study of education management by integrating transformational leadership theory and the concept of organizational adaptability in the context of digital transformation. This research places transformational leadership not only as a factor influencing teacher behavior and motivation, but also as a strategic ability in building a responsive, flexible, innovative, and sustainable education management system. Practically, the results of the research are expected to be the basis for school principals, managers of educational institutions, the government, and professional development institutions in designing leadership training, improving digital competence, developing a culture of innovation, empowering teachers, and strengthening data-driven decision-making. Thus, this research can

contribute to the formation of educational institutions that are more resilient and able to maintain the effectiveness of their management in the midst of rapid technological changes.

LITERATURE REVIEW

Transformational Leadership in Education Management

Transformational leadership is a leadership approach that is oriented towards change through the formation of a shared vision, the provision of inspirational motivation, intellectual stimulation, exemplarism, and attention to the individual needs of the organization's members. In educational institutions, transformational leaders not only carry out administrative functions, but also mobilize teachers and education personnel to achieve change that goes beyond individual interests. Albaqiatussasee et al. (2022) show that principals' transformational leadership practices are reflected through charisma, ideal influence, inspirational motivation, intellectual stimulation, and individualized attention. In a digital education environment, these abilities need to be accompanied by digital competencies because leadership effectiveness is related to the ability of leaders to direct the use of technology, build collaboration, and maintain the satisfaction of organizational members (Antonopoulou et al., 2021).

Transformational Leadership and Digital Education Change

Digitalization of education requires changes in work culture, communication patterns, teacher competencies, learning processes, and decision-making mechanisms. Therefore, transformational leadership in the digital age must be embodied in the ability to build a digital vision, provide support for experimentation, facilitate competency development, and reduce resistance to technology. Rahayu and Iskandar (2023) explain that transformational leadership is relevant to deal with the changing paradigm, technology, and learning demands of the 21st century. Sudrajat et al. (2022) also found that leaders can strengthen digital literacy through training, providing examples of technology use, and resolving obstacles in the form of limited competencies and infrastructure. Thus, digital transformation requires leadership that is able to connect the vision of change with increasing the capacity of organizational members.

Adaptive Education Management in the Digital Era

Adaptive education management refers to the ability of educational institutions to recognize changes in the environment, adjust policies, manage resources flexibly, and maintain the effectiveness of services in the midst of technological developments. In this study, adaptive education management is constructed through organizational responsiveness, management flexibility, data-driven decision-making, organizational learning, innovation, and sustainable technology integration. Adriantoni et al. (2024) show that digital leadership is related to the management of academic services through the use of technology and the development of digital skills. Meanwhile, Herman et al. (2025) found that transformational leadership has a positive effect on the school climate, which shows the importance of organizational conditions that support

change. Pietsch and Mah (2025) add that adapting to new technologies requires leaders who are proactive, empathetic, open, and agile in managing change.

Organizational Empowerment, Innovation and Learning

Adaptive management is not only determined by the principal's decisions, but also by the ability of teachers and education staff to learn, collaborate, and generate innovation. Efendi et al. (2023) found that transformational leadership can increase teachers' commitment and performance in implementing educational changes. Lasrin et al. (2025) also show that transformational leadership has a significant effect on teacher innovation, especially when accompanied by technological literacy, moral support, and space to experiment. The findings are consistent with Vermeulen et al. (2022), who explain that transformational leadership shapes organizational learning climates and leader-teacher relationships that support innovative behaviors. Thus, human resource empowerment is an important mechanism that connects leadership with the adaptability of educational institutions.

The Relationship of Transformational Leadership and Adaptive Education Management

Previous studies have proven the relationship between transformational leadership and commitment, school climate, digital competence, innovation, and teacher performance. However, most of these studies still test the outcomes of various changes separately and have not yet placed adaptive education management as a complete organizational construct. Based on the synthesis of the literature, ideal influence can strengthen belief in change; inspirational motivation can build a commitment to a digital vision; intellectual stimulation can encourage innovation and problem-solving; Meanwhile, individual attention can increase the readiness of organizational members. This combination conceptually allows educational institutions to respond to change in a more flexible, collaborative, data-driven, and sustainable way. On that basis, this study places transformational leadership as an exogenous variable and adaptive education management as an endogenous variable tested through PLS-SEM.

Research Hypothesis

Based on these theories and empirical findings, the research hypothesis is formulated as follows:

H1: *Transformational leadership has a positive and significant effect on the formation of adaptive education management in the digital era.*

This hypothesis shows that the stronger the leader's ability to build a digital vision, motivate, stimulate innovative thinking, empower human resources, and pay attention to individual needs, the higher the flexibility, responsiveness, learning ability, and effectiveness of the management of educational institutions.

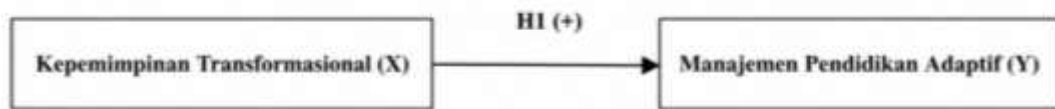


Figure 1. Conceptual Framework

Remarks: The positive sign in H1 indicates the suspicion that the improvement of transformational leadership will be followed by the improvement of the institution's ability to implement adaptive education management.

METHODOLOGY

Types of Research

This study uses a quantitative approach with explanatory design and cross-sectional survey methods. This approach was used to test the influence of transformational leadership as an exogenous variable on adaptive education management as an endogenous variable in the digital era. Data were collected in one observation period to illustrate the respondents' perception of the conditions of leadership and education management when the research was carried out. The Partial Least Squares-Structural Equation Modeling (PLS-SEM) analysis was chosen because both variables are latent constructs measured through a number of indicators and research oriented towards testing relationships and model predictions. PLS-SEM also allows simultaneous evaluation of measurement models and structural models (Dash & Paul, 2021; Hair & Alamer, 2022).

Population and Sample

The research population consists of principals and teachers at the primary and secondary education levels in Mataram City, West Nusa Tenggara Province, who have utilized digital technology in administration, communication, management, or learning. Respondents must be active, have a minimum working period of one year, and be involved in the implementation of digital-based education policies. A sample of 180 respondents was selected using a probability technique in the form of proportional stratified random sampling. The population was grouped based on education level, educational unit, and position, then the sample in each group was proportionally determined and randomly selected. This technique is used to maintain the representation of each group while reducing respondent selection bias (Damayanti, 2021; Yuntina et al., 2025).

Research Instruments

Data were collected using a five-level Likert scaled closed-ended questionnaire, ranging from 1 = strongly disagree to 5 = strongly agree. The instrument consists of two main parts. The construct of transformational leadership is measured through 15 statements that include ideal influence, inspirational motivation, intellectual stimulation, individual attention, as well as digital vision and empowerment. The items were compiled by adapting the transformational leadership scale used by Sofiah et al. (2022) and Yuntina et al. (2025), then contextualized with digital leadership indicators from Mudjiono and Fatoni (2024).

The adaptive education management construct is measured through 15 statements that include management flexibility, responsiveness to change, data-driven decision-making, organizational learning, and continuous technology innovation and integration. Because adaptive education management is a construct synthesized in this study, the items were developed based on indicators of readiness to face change from Primandaru and Kairupan (2024), as well as indicators of technology adaptation, collaboration, management support, and innovation from Faradila and Daryono (2024).

The draft instruments were examined by three experts in the fields of education management, leadership, and research methodology to assess the suitability of the content, editorial clarity, and relevance of the indicators. The trial was then carried out on 30 respondents outside the main sample. Convergent validity was assessed based on outer loading and average variance extracted (AVE), while discriminant validity was examined using heterotrait-monotrait ratio (HTMT). Construct reliability is evaluated through Cronbach's alpha, rho_A, and composite reliability. The instrument is declared adequate if the AVE is ≥ 0.50 , the reliability ≥ 0.70 , and the HTMT value is below 0.90 (Cheung et al., 2024; Hair & Alamer, 2022).

Data Collection Procedure

The research began with the preparation of instruments based on the study of theory and operational definition of variables. After obtaining permits from relevant agencies and schools in Mataram City, the instrument was validated by experts and tested on 30 principals or teachers outside the main sample. The questionnaire was distributed directly and through an online form to selected respondents. The use of structured questionnaires allows perception data on transformational leadership and adaptive education management to be collected efficiently and analyzed using PLS-SEM (Ma'ruf & Widyaningrum, 2025; Sofiah et al., 2022). Respondents were given an explanation of the research objectives, data confidentiality, and voluntary nature of participation. After checking the completeness and feasibility of answers, as many as 180 questionnaires were determined as the final data of the research.

Data Analysis Techniques

Preliminary analysis was conducted using IBM SPSS Statistics to produce a distribution of frequency, percentage, average, standard deviation, and demographic profile of respondents. Hypothesis testing was carried out using SmartPLS 4 through two stages. The first stage is the evaluation of the measurement model which includes outer loading, AVE, Cronbach's alpha, rho_A, composite reliability, and HTMT. Indicators with low outer loading are considered to be phased out while still paying attention to the validity of the construct content. The second stage is the evaluation of the structural model through the examination of the variance inflation factor (VIF), path coefficient, determination coefficient (R^2), effect size (f^2), and predictive relevance (Q^2). The significance of the influence was tested using a bootstrapping procedure of 5,000 subsamples at a significance level of 5%. The H1 hypothesis is accepted if the coefficient of the transformational leadership path towards adaptive education management has a positive value, a $p < 0.05$, and a confidence interval of 95% does not include zero. These stages allow researchers to assess the quality of constructs as well as the strength and direction of interconstruct relationships systematically (Cheung et al., 2024; Faradila & Daryono, 2024; Hair & Alamer, 2022).

RESEARCH RESULT

Respondent Characteristics

A total of 180 questionnaires were declared complete and worthy of analysis. Respondents came from 30 primary and secondary education schools in Mataram City, West Nusa Tenggara Province. The composition of respondents consisted of 30 school principals and 150 teachers. Based on education level, respondents from elementary schools had the largest proportion, which was 40.0%, followed by junior high school at 33.3% and high school and vocational schools at 26.7%.

Table 1. Respondent Characteristics

Features	Category	Frequency	Percentage
Departments	Principal	30	16,7%
	Teacher	150	83,3%
Education level	SD	72	40,0%
	Junior High School	60	33,3%
	High School/Vocational School	48	26,7%
Gender	Male	76	42,2%
	Women	104	57,8%
Working period	1–5 years	28	15,6%
	6–10 years	51	28,3%
	11–15 years	56	31,1%
	More than 15 years	45	25,0%

Descriptive Analysis Results

The results of the descriptive analysis showed that transformational leadership obtained an average score of 4.12 with a standard deviation of 0.48, so it was in the high category. The dimension with the highest score was digital vision and enablement, with an average of 4.33. Meanwhile, individual attention obtained the lowest score of 3.94, although it is still in the high category. Adaptive education management obtained an average score of 4.06 with a standard deviation of 0.50. The innovation and technology integration dimension received the highest score of 4.21, while data-driven decision-making received the lowest score of 3.82. These results show that educational institutions have been relatively responsive in using technology, but the use of data as a basis for decision-making is still not as strong as other adaptation dimensions.

Table 2. Descriptive Statistics of Research Variables

Variables and dimensions	Average	Standard deviation	Category
Transformational leadership	4,12	0,48	Height
Ideal influence	4,07	0,52	Height
Inspirational motivation	4,15	0,49	Height
Intellectual stimulus	4,09	0,54	Height
Individual attention	3,94	0,58	Height
Digital vision and empowerment	4,33	0,46	Very high
Adaptive education management	4,06	0,50	Height
Management flexibility	4,08	0,52	Height
Responsiveness to change	4,14	0,49	Height
Data-driven decision-making	3,82	0,61	Height
Organizational learning	4,05	0,55	Height
Technology innovation and integration	4,21	0,48	Very high

At the indicator level, the highest score was found in the clarity of the digital leader's vision of 4.35, the provision of participation space to teachers at 4.31, and collaboration in the application of technology at 4.24. The indicator with the lowest score is the consistency of digital data use in decision-making, which is 3.79.

Evaluation of Measurement Models

Evaluation of the measurement model showed that all 30 indicators met the requirements of convergent validity. The *outer loading* value of the transformational leadership indicator is in the range of 0.724–0.889, while the adaptive education management indicator is in the range of 0.711–0.876. Since all values are above 0.70, no indicators are removed from the model. The *average variance extracted* value for transformational leadership was 0.646 and adaptive education management was 0.618. The two values exceed the limit of 0.50 so that they meet the validity of the convergence. Cronbach's alpha, rho_A, and *composite reliability* values were also above 0.70, indicating that both constructs have good internal consistency.

Table 3. Construct Validity and Reliability Results

Construct	Outer loading	AVE	Cronbach's alpha	rho_A	Composite reliability	Conclusion
Transformational leadership	0,724–0,889	0,646	0,935	0,938	0,948	Valid and reliable
Adaptive education management	0,711–0,876	0,618	0,927	0,930	0,941	Valid and reliable

The validity of the discriminant was tested using the *heterotrait-monotrait* ratio. The HTMT value between transformational leadership and adaptive education management was 0.784. The value is below the limit of 0.90, so that both constructs have adequate discriminant validity.

Table 4. Discriminatory Validity Results

Construct Relationships	HTMT Value	Acceptance Limits	Conclusion
Transformational Leadership– Adaptive Education Management	0,784	< 0.90	Discriminant validity fulfilled

Structural Model Evaluation

The results of the structural model evaluation showed a variance *inflation factor* value of 1,000. This value shows that the model does not experience collinearity problems. The value of the adaptive education management determination coefficient was 0.464, while the adjusted value (R^2) was 0.461. These results show that transformational leadership is able to explain 46.4% of adaptive education management variations. Another 53.6% of the variation was explained by other factors not included in the study model. An effect size value (f^2) of 0.866 indicates a large influence, while a value (Q^2) of 0.286 indicates that the model has predictive relevance.

Table 5. Structural Model Evaluation Results

Indicator	Value	Interpretasi
VIVID	1,000	No collinearity
(R^2)	0,464	Moderate
Adjusted (R^2)	0,461	Moderate
(f^2)	0,866	Huge effect
(Q^2)	0,286	Has predictive relevance

Hypothesis Testing

Hypothesis testing was carried out using a *bootstrapping* procedure of 5,000 subsamples. The test results produced a path coefficient of 0.681 with a t-statistical value of 14.972 and a p-value of less than 0.001. The 95% confidence interval is in the range of 0.590–0.758 and does not include zeros. These results show that transformational leadership has a positive and significant effect on adaptive education management. Thus, H1 is accepted. The positive coefficient shows that the improvement of transformational leadership is followed by increased flexibility, responsiveness, organizational learning, innovation, and technology integration in education management.

Table 6. Hypothesis Testing Results

Hipotesis	Interconstruct Relationship	Path Coefficient	T-Statistics	P-Value	95% Confidence Interval	Verdict
H1	Transformational Leadership → Adaptive Education Management	0,681	14,972	< 0.001	0,590–0,758	Accepted

Key Research Findings

The research yielded three key findings. First, transformational leadership and adaptive education management are in the high category based on the perception of principals and teachers. Second, transformational leadership is able to explain 46.4% of the variation in the adaptive ability of educational institutions. Third, transformational leadership has a positive and significant influence on adaptive education management with a path coefficient of 0.681.

Strengthening digital vision and empowering human resources are the aspects of leadership with the highest value. In adaptive education management, innovation and technology integration as well as responsiveness to change are the most prominent aspects. Meanwhile, individual attention and data-driven decision-making obtained relatively lower scores compared to other dimensions. Overall, the results of the study support the research objectives and show that improving the quality of transformational leadership is related to the strengthening of the ability of educational institutions in Mataram City to adjust management, respond to technological changes, develop innovation, and build collaboration.

DISCUSSION

The results of the study showed that transformational leadership had a positive and significant effect on adaptive education management with a path coefficient of 0.681, a t value of 14.972, and a $p < 0.001$. A value (R^2) of 0.464 indicates that transformational leadership is able to explain 46.4% of adaptive education management variations, while the remaining 53.6% are influenced by factors outside the model. A value of (f^2) of 0.866 indicates a large measure of influence, while (Q^2) of 0.286 confirms that the model has predictive relevance. The findings support the research hypothesis that the stronger the practice of transformational leadership, the higher the ability of educational institutions to respond to change in a flexible, innovative, and sustainable manner.

This influence can be explained through the character of transformational leadership that directs members of the organization to a shared vision, provides motivation, encourages critical thinking, and empowers teachers in the process of change. The dimensions of digital vision and empowerment obtained the highest average of 4.33, which shows that the clarity of the direction of transformation and the involvement of human resources are the main forces in the management of education in Mataram City. These findings are in line with Rahayu and Iskandar (2023), who place transformational leadership as an important approach in dealing with the changing learning of the 21st century. Albaqiatussasee et al. (2022) also affirm that inspirational motivation, ideal influence, intellectual stimulation, and individual attention are behaviors that enable principals to drive change collectively.

The high level of innovation and integration of technology, with an average of 4.21, shows that the leader's vision has translated into the use of technology, the development of new practices, and the collaboration of school citizens. These results are consistent with Lasrin et al. (2025), who found that transformational leadership influences teacher innovation, particularly through moral support, space for experimentation, and strengthening technological literacy. Adriantoni et al. (2024) also show that digital leadership contributes to increasing the speed, accessibility, and effectiveness of academic services. In the international context, AlAjmi (2022) found that digital leadership of school principals encourages the integration of technology by teachers, while Vermeulen et al. (2022) show that the influence of leadership on innovative behavior takes place through the learning climate of the organization and the quality of the leader-teacher relationship.

Although all dimensions were in the high category, individual attention obtained the lowest average on the transformational leadership variable, which was 3.94. Data-driven decision-making is also the lowest dimension in adaptive education management with an average of 3.82. The findings show that digital transformation is stronger in terms of vision, technology use, and innovation than personal assistance and systematic use of data. This condition can occur when school principals focus more on achieving the organization's digital targets rather than the competency needs of each teacher. In fact, Hikmah and Sutapa (2025) show that digital leadership and empowerment training together increase teachers' self-efficacy. Therefore, school digitalization needs to be accompanied

by individual coaching, increased data literacy, and evidence-based evaluation mechanisms.

The magnitude of the influence in this study was higher than the research of Herman et al. (2025), which found that transformational leadership only explains 11.5% of the variation in school climate, and the study of Hikmah and Sutapa (2025), which obtained (R^2) 31.3% for the influence of digital leadership and empowerment training on teachers' self-efficacy. The coefficient of this study is also higher than the influence of transformational leadership on teacher innovation reported by Lasrin et al. (2025), which is 0.383. These differences can be caused by adaptive education management constructs that include broader organizational outputs, including flexibility, responsiveness, organizational learning, and technology integration. In addition, differences in respondent characteristics, locations, instruments, and the number of variables in the model can result in different amounts of influence.

The research findings also reinforce the view that leadership influence does not always take place through direct instruction. Efendi et al. (2023) found that work commitment is a mechanism that connects transformational leadership with teacher performance. Berkovich and Hassan (2025) show that teachers' affective commitment plays an important role in the relationship between digital transformational leadership and school effectiveness. Thus, the positive influence in this study is likely to be amplified by teacher commitment, trust in leaders, culture of collaboration, technological readiness, and organizational learning climate, although these factors have not been directly tested.

Theoretically, this study expands the study of educational leadership by placing adaptive educational management as an organizational output that includes the ability to respond to change, not just individual performance or satisfaction. Practically, the results show that strengthening leadership in the digital era needs to be directed towards the preparation of operational digital visions, teacher empowerment, cross-functional collaboration, innovation, and the use of data in decision-making. School principals are not enough to play the role of technology managers, but must be the driving force of organizational learning and human capacity development. This is relevant to the findings of Herman et al. (2025) that transformational leadership contributes to the formation of a more effective school climate.

This study has limitations because it uses a cross-sectional design, so the relationships found have not fully proven long-term causality. The data also comes from perception questionnaires filled out by school principals and teachers in one region, so it has the potential to contain social desire bias and cannot be generalized to all educational institutions. The model uses only one exogenous variable, whereas educational adaptability can also be influenced by digital infrastructure, organizational culture, technological literacy, policy support, and teacher readiness. The next research is suggested to use longitudinal or mixed methods design, expand the area and level of education, and test organizational commitment, self-efficacy, digital literacy, and learning climate as mediation or moderation variables.

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that transformational leadership has a positive and significant effect on adaptive education management in the digital era. The path coefficient of 0.681 with a p <value of 0.001 shows that strengthening digital vision, inspirational motivation, intellectual stimulation, individual attention, and human resource empowerment is able to increase flexibility, responsiveness, organizational learning, as well as innovation and technology integration in education management. Transformational leadership was able to explain 46.4% of adaptive education management variations. Digital vision and empowerment are the most powerful aspects of leadership, while innovation and technology integration are the most prominent aspects of adaptability.

Based on these findings, school principals and education managers are advised to strengthen transformational leadership competencies through digital vision training, teacher empowerment, collaboration, and change management. Special attention needs to be paid to individual mentoring and improved data usability as both aspects obtain relatively lower values. Local governments and educational institutions also need to provide infrastructure, data literacy programs, and digital evaluation systems so that technological transformation can be implemented in a directed, inclusive, and sustainable manner.

ADVANCED RESEARCH

Further research is suggested using longitudinal or mixed methods design, expanding the area and level of education, and involving data sources other than questionnaires. The research model can be developed by examining digital literacy, organizational culture, teacher commitment, self-efficacy, technology readiness, and policy support as mediating or moderation variables in the relationship between transformational leadership and adaptive education management.

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