

Technology-Mediated Sustainability of Organizational Change: Leadership Support and HR Capacity in Public Training

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Article Info

Article history:

Submission June 03, 2026

Revised July 31, 2026

Accepted August 24, 2026

Published September 1, 2026

Keywords:

Administrator Leadership

Digital Transformation

Leadership Support

Public Sector

PLS-SEM



ABSTRACT

Sustaining organizational change following public-sector leadership training remains a major challenge, as post-training innovations frequently fail to become institutionalized due to leadership turnover and staff rotation. Although widely studied, empirical evidence explaining how leadership, human resources, and technology interact to sustain public-sector change remains limited. This study investigates the mediating role of Technology Utilization in the relationship between Leadership Support, Human Resource Capacity, and the Sustainability of Change Actions following the Administrator Leadership Training (PKA) at PPSDM Regional Bukittinggi, Indonesia. Using a quantitative explanatory design, data from 135 alumni were analyzed via Structural Equation Modeling Partial Least Squares (SEM-PLS). The results indicate that Technology Utilization significantly drives change sustainability ($\beta = 0.421, p < 0.05$) and mediates the effects of Leadership Support ($\beta = 0.208, p < 0.05$) and Human Resource Capacity ($\beta = 0.180, p < 0.05$). Conversely, direct effects of leadership and human resources were not statistically significant, demonstrating that sustainability relies on technology-enabled institutionalization rather than leadership or human capability alone. The model explains 75.2% of the variance in sustainability ($R^2 = 0.752$). This study proposes the Technology-Mediated Sustainability of Change (TMSC) framework, extending Socio-Technical Systems Theory by positioning technology as the institutional mechanism transforming leadership support and human resource capacity into sustainable organizational practices. The findings offer practical guidance for government institutions and training providers to strengthen digital governance, knowledge management, and technology-enabled systems to ensure long-term change sustainability.

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DOI: <https://doi.org/10.34306/itsdi.v8i1.740>

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1. INTRODUCTION

Sustaining organizational change remains a persistent challenge in public sector reform, particularly following leadership development programs designed to enhance institutional performance [1]. Although governments allocate significant resources to leadership training [2, 3], post-training innovations frequently decline following leadership succession, employee rotation, or restructuring, leaving initiatives dependent on individ-

ual actors rather than institutionalized systems [4]. As public institutions accelerate digital transformation to enhance accountability and service quality [5], digital technologies become essential strategic infrastructures to preserve knowledge, standardize processes, and maintain long-term organizational resilience [6]. This challenge is clearly illustrated in the Administrator Leadership Training Program (*Pelatihan Kepemimpinan Administrator/PKA*) at PPSDM Regional Bukittinggi; between 2021 and 2024, the program trained 844 administrators across 23 cohorts [7], yet a post-training evaluation revealed that approximately 51% of implemented Change Actions failed to be sustained in the medium or long term [8]. Factors influencing this sustainability included technology utilization (51.9%), human resource capacity (42.3%), and leadership support (23.1%), highlighting that long-term change requires institutionalizing innovation through technology-supported governance mechanisms [9].

Despite growing interest in leadership support, human resource capability, digital transformation, and organizational sustainability, previous studies generally analyze these constructs independently or merely as direct performance drivers [10, 11]. Consequently, limited empirical evidence explains the organizational mechanisms through which leadership support and human resource capability are transformed into sustainable change [12, 13]. To bridge this gap, this study adopts Socio-Technical Systems Theory (STS), which posits that sustainable outcomes emerge from the dynamic interaction between social systems (leadership and human capabilities) and technical systems (digital technology and infrastructures) [14, 15, 16]. In public sector environments characterized by frequent leadership transitions and employee mobility [17], leadership support establishes strategic vision and legitimacy while human resource capacity provides necessary implementation skills [18]. However, these social assets remain vulnerable unless technology acts as a bridge to embed individual capabilities into formal governance structures and routines.

Accordingly, this study positions technology as a key mediating variable rather than solely a direct determinant or static resource [19, 20]. Rather than directly guaranteeing sustainability, leadership support and human resource capacity enhance the organization's ability to adopt, integrate, and institutionalize digital technologies, which in turn embeds innovations into routine governance practices [21]. Digital platforms, workflow automation, and information systems allow organizations to codify knowledge, standardize procedures, and maintain continuous learning beyond individual tenure [22, 23]. While existing empirical literature acknowledges individual linkages among leadership, HR capability, technology, and performance [24], it offers limited insight into how technology serves as the causal, institutionalizing bridge that converts temporary human commitments into lasting institutional capacity.

To address these limitations, this study introduces the Technology-Mediated Sustainability of Change (TMSC) framework as an integrated model for post-training change sustainability [25]. Moving beyond isolated perspectives, the TMSC framework conceptualizes technology as an institutional mechanism that preserves organizational memory, standardizes processes, and sustains innovation despite leadership succession or personnel reassignment [26]. Furthermore, by demonstrating how technology institutionalizes governance innovations, this research aligns with global sustainable governance agendas, specifically supporting United Nations Sustainable Development Goals (SDGs) 9, 16, and 17 [27, 28].

Grounding itself in this framework, this study investigates how technology mediates the relationships between leadership support, human resource capacity, and the sustainability of Change Actions by addressing four primary research questions regarding: (RQ1) the influence of leadership support on technology utilization, (RQ2) the influence of human resource capacity on technology utilization, (RQ3) the effect of technology utilization on change sustainability, and (RQ4) the mediating role of technology across these paths. This research contributes by advancing organizational change theory through the TMSC framework, enriching digital transformation literature regarding technology's institutionalizing function [29], and offering actionable policy insights for leadership development institutions. The remainder of this paper is organized as follows: Section 2 reviews literature and hypotheses; Section 3 outlines methodology; Section 4 presents empirical results and discussion; and Sections 5 and 6 present conclusions, theoretical, practical, and policy implications [30].

2. LITERATURE REVIEW

2.1. Theoretical Foundation: Socio-Technical Systems Theory

Socio-Technical Systems Theory (STS), introduced by Trist and Bamforth (1951), explains that sustainable organizational performance is achieved through the integration of social systems, including leadership, Human Resource Capacity, and organizational culture, with technical systems such as digital technologies, in-

formation infrastructures, and work processes. STS emphasizes that technology should not be viewed merely as an organizational resource but as a system that must be aligned with human capabilities and organizational processes to achieve effectiveness. In the digital transformation era, organizational success depends not only on Technology Utilization but also on its integration into governance, decision-making, and organizational routines.

In public-sector organizations, STS is particularly relevant because leadership succession, employee rotation, and bureaucratic restructuring often threaten organizational continuity. Leadership support and human resource capacity represent the social subsystem, while technology functions as the technical subsystem that institutionalizes knowledge, standardizes processes, facilitates coordination, and preserves organizational memory. Therefore, this study conceptualizes technology utilization as a mediating mechanism linking leadership support and human resource capacity to sustainable Change Actions through the Technology-Mediated Sustainability of Change (TMSC) framework.

2.2. Sustainability of Change Actions Following Administrator Leadership Training

Administrator Leadership Training (*Pelatihan Kepemimpinan Administrator*/PKA) is a strategic leadership development program designed to strengthen managerial competence among Indonesian civil servants. Based on Regulation of the National Institute of Public Administration (LAN) No. 5 of 2022, participants are required to develop Change Actions addressing organizational problems and improving governance and public services. Therefore, training effectiveness should be measured not only through competency improvement but also through the sustainability of innovations after participants return to their institutions.

The sustainability concept is rooted in Lewin's (1947) change model, particularly the refreezing stage, where new practices become institutionalized. Similarly, the Kirkpatrick Model emphasizes that effective training should generate sustained behavioral changes and long-term organizational outcomes. However, previous studies have mainly evaluated leadership training through satisfaction, competency improvement, and short-term performance, with limited attention to mechanisms supporting long-term innovation sustainability. Accordingly, this study defines Change Action sustainability as the long-term continuation, institutionalization, and integration of innovations generated through PKA.

2.3. Leadership Support

Leadership support is a critical factor in sustaining organizational change, particularly within public organizations undergoing digital transformation. Leaders contribute by establishing vision, allocating resources, strengthening employee commitment, and reducing resistance to change. Kotter (2012) argues that sustainable transformation requires leaders to institutionalize new practices into organizational routines, while Bass and Riggio (2006) emphasize that transformational leadership promotes innovation, commitment, and continuous learning.

From the STS perspective (Trist & Bamforth, 1951), leadership represents an essential element of the social subsystem that influences organizational readiness for technological change. Leadership support includes not only motivation but also digital innovation promotion, technology resource allocation, governance development, and the creation of a culture supporting information system utilization. Recent studies demonstrate that digital leadership enhances Technology Utilization, organizational innovation, and resilience by integrating technology into strategic management processes.

Although previous research confirms the positive influence of leadership on organizational outcomes, limited studies explain how leadership support contributes to sustainable organizational change. This study argues that leadership influences Change Action sustainability indirectly through technology utilization, where technology institutionalizes leadership initiatives into organizational routines beyond individual leadership periods.

2.4. Human Resource Capacity

Human resource capacity is a fundamental organizational capability determining adaptation, innovation, and sustainable performance. Human Capital Theory explains that investment in employees' knowledge, skills, competencies, and experience enhances productivity and organizational competitiveness. In public organizations, human resource capacity includes not only technical competence but also adaptability, collaboration, problem-solving ability, and readiness to support organizational change.

Based on STS, Human Resource Capacity represents the social subsystem interacting with technology to produce sustainable outcomes. Employees influence how technologies are adopted, integrated, and applied

within organizational processes. Recent studies show that organizations with stronger employee competencies and digital capabilities achieve greater success in digital transformation, organizational learning, and institutional resilience.

However, previous studies have mainly examined human resource capacity as a direct predictor of innovation, productivity, and service quality. Limited attention has been given to its role in sustaining organizational change through technology utilization. This study argues that competent employees enable effective technology adoption, while technology institutionalizes employee knowledge and innovation into standardized organizational processes, thereby strengthening Change Action sustainability.

2.5. Technology as the Mediating Mechanism

Technology has transformed from an operational support tool into a strategic mechanism enabling organizational transformation and sustainability. Digital technologies, including information systems, workflow automation, digital platforms, and performance-monitoring applications, support coordination, knowledge management, transparency, and continuous improvement. However, technology does not independently create sustainability; rather, it provides institutional mechanisms through which leadership initiatives and employee capabilities become embedded within organizational systems.

Within STS, technology represents the technical subsystem interacting with leadership and Human Resource Capacity as social components. Leadership provides strategic direction, while human resources provide knowledge and operational capability. Nevertheless, these resources may disappear due to leadership turnover or employee mobility unless embedded within digital systems that preserve knowledge, standardize processes, and support organizational learning.

Although previous studies identify technology as a predictor of organizational performance, limited research examines its mediating role in sustaining organizational change. Therefore, this study positions technology utilization as a mediator that transforms leadership support and human resource capacity into institutionalized organizational capabilities through the TMSC framework.

2.6. Technology-Mediated Sustainability of Change (TMSC) Framework

Based on STS and organizational change literature, this study proposes the Technology-Mediated Sustainability of Change (TMSC) framework to explain how post-training innovations become institutionalized in public organizations. The framework argues that sustainable Change Actions cannot be achieved through leadership support and human resource capacity alone but require technology-enabled systems that preserve knowledge, standardize processes, facilitate coordination, and support continuous learning.

The TMSC framework extends previous studies in three ways. First, leadership research has mainly focused on direct relationships between leadership and organizational outcomes. Second, human resource studies have emphasized competency and performance without explaining how employee capabilities become sustainable organizational resources. Third, digital transformation studies have generally treated technology as a direct predictor rather than an institutional mechanism connecting leadership and human capabilities with sustainability.

Therefore, TMSC positions technology utilization as a mediating mechanism linking leadership support and human resource capacity with Change Action sustainability. This framework shifts the focus from technology adoption toward technology-enabled institutionalization, explaining how digital systems maintain organizational continuity despite leadership succession, employee rotation, and bureaucratic restructuring.

2.7. Conceptual Framework and Hypotheses

2.7.1. Leadership Support and Technology Utilization

Leadership support facilitates Technology Utilization by providing strategic direction, organizational commitment, and resources necessary for digital transformation. According to Socio-Technical Systems Theory and supported by Verhoef et al. (2021), leadership creates organizational conditions that encourage effective technology utilization.

H1: Leadership support positively affects technology utilization.

2.7.2. Human Resource Capacity and Technology Utilization

Human resource capacity enhances organizations' ability to adopt and effectively utilize digital technologies. Based on Human Capital Theory (Becker, 1964), competent employees possess the knowledge and

skills required to implement technological innovation. Previous studies also confirm that employee capability significantly improves digital transformation outcomes.

H2: Human resource capacity positively affects technology utilization.

2.7.3. Technology Utilization and Sustainability of Change Actions

Technology utilization institutionalizes organizational knowledge, standardizes work processes, and supports continuous monitoring, thereby enhancing the sustainability of organizational change. From the perspective of Socio-Technical Systems Theory, technology serves as the technical subsystem that enables sustainable organizational transformation.

H3: Technology utilization positively affects the sustainability of Change Actions.

2.7.4. The Mediating Role of Technology between Leadership Support and Sustainability

Leadership support may initiate organizational change by providing strategic direction, organizational legitimacy, and resources. However, such support may not be sufficient to ensure the long-term sustainability of Change Actions when organizational practices remain dependent on individual leaders. Technology Utilization provides an institutional mechanism through which leadership initiatives can be embedded into digital systems, organizational routines, documentation processes, and technology-enabled workflows. Therefore, the effect of Leadership Support on the Sustainability of Change Actions is expected to operate through Technology Utilization.

H4: Technology Utilization mediates the relationship between Leadership Support and the Sustainability of Change Actions ($X1 \rightarrow X3 \rightarrow Y$).

2.7.5. The Mediating Role of Technology between Human Resource Capacity and Sustainability

Human Resource Capacity provides the knowledge, skills, competencies, and adaptive capabilities required to implement organizational innovation. Nevertheless, these individual capabilities may not automatically become sustainable organizational resources unless they are captured, standardized, and integrated into organizational systems. Technology Utilization enables organizations to institutionalize employee knowledge, facilitate collaboration, standardize processes, and preserve organizational memory. Accordingly, Human Resource Capacity is expected to contribute to the Sustainability of Change Actions indirectly through Technology Utilization.

H5: Technology Utilization mediates the relationship between Human Resource Capacity and the Sustainability of Change Actions ($X2 \rightarrow X3 \rightarrow Y$).

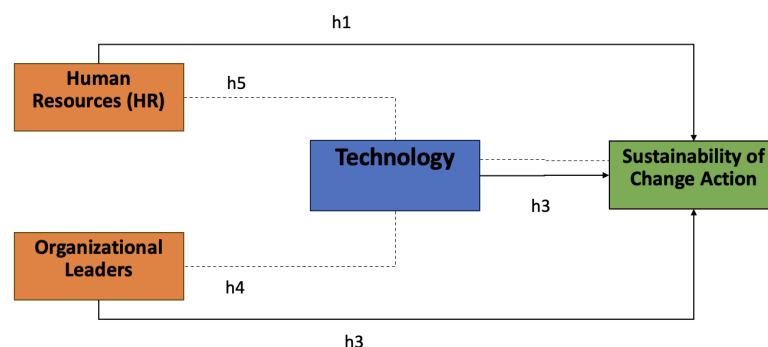


Figure 1. Conceptual Framework

As illustrated in Figure 1, Technology Utilization ($X3$) is positioned as the mediating mechanism linking Leadership Support ($X1$) and Human Resource Capacity ($X2$) with the Sustainability of Change Actions (Y). $H1$ and $H2$ represent the effects of Leadership Support and Human Resource Capacity on Technology Utilization, while $H3$ represents the effect of Technology Utilization on sustainability. $H4$ and $H5$ represent indirect or mediation pathways, namely $X1 \rightarrow X3 \rightarrow Y$ and $X2 \rightarrow X3 \rightarrow Y$, respectively. Thus, the mediation lines in Figure ?? should be interpreted as indirect relationships operating through Technology Utilization rather than as additional direct effects.

3. RESEARCH METHODS

3.1. Research Design

This study employed a quantitative explanatory research design to examine the direct and indirect relationships among leadership support, human resource capacity, technology utilization, and the sustainability of Change Actions following Administrator Leadership Training (*Pelatihan Kepemimpinan Administrator*—PKA). The explanatory approach was selected because the study aimed to test a theoretically developed causal model and explain the mechanism through which organizational factors influence post-training innovation sustainability.

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with Smart-PLS software. PLS-SEM was selected because it is suitable for predictive studies, mediation analysis, and theory development involving multiple latent constructs measured through reflective indicators. Additionally, PLS-SEM is less restrictive regarding normality assumptions and performs effectively for complex models with moderate sample sizes. Considering that the Technology-Mediated Sustainability of Change (TMSC) framework examines both direct and indirect relationships among four latent variables, PLS-SEM was considered the most appropriate analytical method.

3.2. Research Setting and Participants

The research was conducted at PPSDM Regional Bukittinggi, an accredited public training institution under the Ministry of Home Affairs of the Republic of Indonesia. The institution is responsible for implementing Administrator Leadership Training (PKA), which aims to strengthen managerial competencies of administrator-level civil servants through competency development and organizational Change Actions.

The unit of analysis consisted of PKA alumni who had completed training and implemented Change Actions within their respective organizations. Only alumni who had completed the post-training implementation period were included because they possessed sufficient experience to evaluate the continuation, institutionalization, and sustainability of their organizational innovations.

3.3. Population, Sampling Procedure, and Sample Size

The study's target universe encompassed 844 graduates of the PKA program trained at PPSDM Regional Bukittinggi spanning the 2021–2024 period. These alumni represent diverse administrative tiers, including central ministries alongside provincial, regency, and municipal administrative bodies across Indonesia.

A purposive sampling strategy was employed, governed by three inclusion parameters: (1) successful completion of the PKA course, (2) active execution of an organizational Change Action project, and (3) fulfillment of the post-training evaluation timeframe. This filtering process guaranteed that participants possessed direct, first-hand engagement with institutional change continuity.

Sample adequacy was established using two PLS-SEM benchmarks. Initially, a G*Power calculation specifying a medium effect size ($f^2 = 0.15$), significance level ($\alpha = 0.05$), statistical power of 0.80, and three direct predictors indicated a baseline requirement of roughly 80 subjects. Subsequently, following the ratio guideline proposed research at least five observations per item across the 27 survey indicators, a target threshold of 135 participants was derived. Consequently, a total sample of 135 respondents was gathered, satisfying both statistical power requirements and structural modeling guidelines.

The sample predominantly comprises participants from the 2024 PKA cohort due to the accessibility of contemporary post-evaluation metrics. This demographic clustering is recognized as a research limitation regarding generalizability across earlier cohorts.

3.4. Questionnaire Development and Measurement

Primary empirical data were gathered via a structured survey instrument derived from established measurement scales, tailored specifically to the context of Indonesian public sector leadership training. The questionnaire evaluated four core latent variables: Leadership Support, Human Resource Capacity, Technology Utilization, and Sustainability of Change Actions.

Operational items for Leadership Support were drawn from literature on transformational leadership and organizational adaptation. Human Resource Capacity measures drew upon Human Capital Theory and organizational capability literature. Constructs for Technology Utilization were operationalized from digital transformation research, whereas Sustainability of Change Actions was contextualized using the post-training evaluation framework established by the National Institute of Public Administration [18]. Subject-matter experts specializing in governance, leadership development, and change management reviewed the instrument to

establish content validity. Responses were scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

3.5. Research Variables

The structural model incorporates four latent constructs. Specifically, Leadership Support and Human Resource Capacity serve as exogenous predictors, Technology Utilization functions as a mediating variable, and Sustainability of Change Actions constitutes the primary endogenous outcome. Comprehensive operational definitions and measurement references are detailed in Table 1.

Table 1. Operational Definition of Research Variables

Variable	Definition	Primary Sources
Leadership Support	Organizational leadership commitment in providing direction, resources, and support for Change Actions	Kotter (2012); Bass & Riggio (2006)
Human Resource Capacity	Employees' competencies, skills, and capabilities to implement organizational innovation	Becker (1964); Teixeira (2010)
Technology Utilization	The extent to which digital technologies are integrated into organizational processes to support Change Actions	Vial (2021); Verhoef et al. (2021)
Sustainability of Change Actions	The long-term continuation and institutionalization of organizational innovations following PKA	LAN (2022); Lewin (1947)

3.6. Data Collection Procedure

Data were collected using a structured self-administered questionnaire distributed electronically to eligible PKA alumni. Before the main survey, the instrument was reviewed by experts in public administration, leadership development, and organizational research to ensure content validity, clarity, and contextual relevance. Several items were refined based on expert recommendations to improve alignment with the Indonesian public-sector context.

The questionnaire was distributed only to alumni who had completed the implementation and evaluation stages of their Change Actions. Participation was voluntary, and respondents were informed about the research objectives, confidentiality procedures, and academic purpose of the study. Anonymity was guaranteed to encourage honest responses and minimize social desirability bias. Following data screening, 135 valid responses were retained for further statistical analysis.

3.7. Common Method Bias Assessment

Because data collection relied entirely on self-reported survey instruments gathered from a uniform respondent pool, Common Method Bias (CMB) was rigorously evaluated prior to hypothesis testing. Adopting the full collinearity variance inflation factor (VIF) procedure advocated by Kock (2015), all constructs yielded VIF metrics strictly below the 3.3 threshold, verifying that common method variance does not distort the empirical findings. Additionally, a complementary diagnostic was conducted via Harman's single-factor test. The initial unrotated factor explained less than 50% of the aggregate variance, confirming that a single dominant factor is absent from the measurement structure. Taken together, these diagnostics confirm that the observed relationships among variables reflect genuine theoretical linkages rather than systematic measurement artifacts.

3.8. Data Analysis

Empirical data processing was executed using Partial Least Squares Structural Equation Modeling (PLS-SEM) within the SmartPLS 4 environment. Following standard protocols, the evaluation proceeded in two sequential phases: assessment of the measurement (outer) model followed by the structural (inner) model.

The outer model was examined to establish indicator reliability, convergent validity, construct internal consistency, and discriminant validity. Item reliability was verified through outer loadings, retaining items with coefficients of ≥ 0.70 . Convergent validity was established as Average Variance Extracted (AVE) metrics exceeded the 0.50 cutoff. Internal consistency was confirmed via Composite Reliability (CR) and Cronbach's Alpha, with both metrics surpassing the 0.70 threshold. Discriminant validity was substantiated using both

the Fornell–Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio, where all HTMT values remained below the conservative 0.90 benchmark.

Upon confirming outer model adequacy, the inner structural model was evaluated through collinearity diagnostics, explanatory power, effect sizes, predictive relevance, and path significance testing. Multicollinearity was ruled out as VIF estimates remained below 3.3. Explanatory capacity was gauged through R^2 values, whereas individual predictor impacts were evaluated via f^2 effect sizes. Out-of-sample predictive relevance was verified through the Stone–Geisser Q^2 statistic, where values above zero indicate satisfactory predictive capability.

Hypothesis testing was performed using a non-parametric bootstrapping procedure with 5,000 resamples. Direct and indirect structural paths were evaluated through path coefficients (β), t -statistics, p -values, and bias-corrected confidence intervals. Specific mediation dynamics were analyzed to determine the indirect mechanisms through which Technology Utilization channels the effects of leadership support and human resource capacity onto Change Action sustainability. Lastly, predictive performance was examined using the PLSpredict algorithm, while overall model adequacy was confirmed via the Standardized Root Mean Square Residual (SRMR), yielding values below the 0.08 threshold.

4. RESULTS AND DISCUSSION

4.1. Descriptive Analysis

The respondents in this study were 135 alumni of the Bukittinggi Regional PPSDM Administrator Leadership Training (PKA) in 2021–2024. Data was collected through an online questionnaire (Google Form). Descriptive analysis was used to describe the characteristics of respondents based on age, year of participation, rank/class, and current position.

Table 2. Respondent Demographic Data

Variable	Category	Frequency	Percentage
Age	31–40 years	28	20.74%
	41–50 years	92	68.15%
	51–60 years old	15	11.11%
Year of Membership	2021	3	2.22%
	2022	4	2.96%
	2023	6	4.44%
	2024	122	90.37%
Rank/Group	III/c	2	1.48%
	III/d	32	23.70%
	IV/a	29	21.48%
	IV/b	72	53.33%
Current Position	Not Echelon	4	2.96%
	Echelon III.b	80	59.26%
	Echelon III.a	45	33.33%
	Echelon II.b	6	4.44%

Based on Table 2, the study respondents were dominated by the age group of 41–50 years (68.15%), which shows that the majority of participants are in a productive career phase and have occupied structural or functional positions equivalent to the level of administrators. This indicates that the respondents have work experience relevant to the implementation of Change Action after the Administrator Leadership Training.

Judging from the year of membership, most of the respondents came from the class of 2024 (90.37%), which shows that the highest response rate came from the latest alumni. This condition indicates that respondents' involvement in training is still relatively strong, increasing the validity of the research's empirical data.

Based on rank and class, respondents were dominated by Group IV/b (53.33%), followed by Groups III/d and IV/a. This shows that the majority of respondents have been at the middle to high career level in the personnel structure, so that they have the capacity and authority to implement organizational change.

Meanwhile, based on current positions, the most respondents are in the position of Echelon III.b (59.26%), followed by Echelon III.a. This shows that this research precisely reaches the main target of PKA,

namely administrator officials who play a direct role in the implementation of organizational policies and innovations.

Overall, the characteristics of the respondents showed that the research sample had a high relevance to the research context, making it feasible to analyze the sustainability of Change Action after the Administrator Leadership Training.

4.2. Measurement Model Evaluation (Outer Model)

The outer model evaluation confirms construct reliability, convergent validity, and discriminant validity. As shown in Table 3, all constructs met the internal consistency requirements, with Cronbach's Alpha and Composite Reliability (ρ_c) values exceeding 0.70, and Average Variance Extracted (AVE) values surpassing the 0.50 threshold. Discriminant validity was also confirmed via the Heterotrait-Monotrait (HTMT) ratio, where all values remained below 0.90 (Table 4).

Table 3. Cronbach's Alpha, Composite Reliability, and AVE Results

Construct	Cronbach's Alpha	rho.a	rho.c	AVE
X1	0.946	0.946	0.954	0.698
X2	0.917	0.918	0.936	0.711
X3	0.938	0.940	0.949	0.700
Y	0.836	0.840	0.890	0.670

Table 4. Heterotrait-Monotrait Ratio (HTMT)

	X1	X2	X3	Y
X1	–			
X2	0.891	–		
X3	0.867	0.872	–	
Y	0.877	0.854	0.828	–

4.3. Structural Model Evaluation (Inner Model)

The structural model was evaluated using bootstrapping with 5,000 resamples. The results of the direct hypothesis testing are presented in Table 5. H1 and H2 examine the effects of Leadership Support (X1) and Human Resource Capacity (X2) on Technology Utilization (X3), respectively, while H3 examines the effect of Technology Utilization (X3) on the Sustainability of Change Actions (Y).

Table 5. Path Coefficient Results (Direct Effect)

Path	Original Sample (O)	Sample Mean (M)	T Statistics	P Values
X1 → Y	0.236	0.238	1.757	0.079
X2 → Y	0.198	0.200	1.545	0.123
X3 → Y	0.421	0.419	3.054	0.002

In the indirect influence test, the results showed that Technology (X_3) acted as a mediating variable (partial mediation). The support of Leadership (X_1) and HR (X_2) not only affects the sustainability of Change Action directly, but also through the use of technology in the organization.

The model's ability to explain endogenous variables was tested using the R^2 value. The results show that:

- Technology R^2 (X_3) = 0.585
- R^2 Sustainability of Change Action (Y) = 0.752

The R^2 value of 0.752 in variable Y indicates that the model has strong explanatory capabilities, where 75.2% of the variation in the sustainability of Change Action can be explained by the variables Leadership

Table 6. Indirect Effect Results (Mediation)

Path	Original Sample (O)	Sample Mean (M)	T Statistics	P Values
X1 → X3 → Y	0.208	0.209	2.563	0.010
X2 → X3 → Y	0.180	0.178	2.466	0.014

Support (X_1), HR (X_2), and Technology (X_3). The remaining 24.8% was explained by other variables outside the research model.

Table 7. Coefficient of Determination (R^2)

Variable	Original Sample (O)	Sample Mean (M)	T Statistics	P Values
X3	0.585	0.691	16.721	0.000
Y	0.752	0.680	14.507	0.000

Effect size testing was conducted to assess the contribution of each exogenous variable to the endogenous variable. The results, as presented in Table 8, indicate that all direct effects fall within the small effect category.

Specifically, Leadership Support (X_1) shows an effect size of 0.040, Human Resource Capacity (X_2) has an effect size of 0.014, and Technology (X_3) records an effect size of 0.103. These values indicate that all exogenous variables have a relatively small direct contribution to the Sustainability of Change Action (Y).

Among the variables, Leadership Support (X_1) demonstrates the highest effect size compared to the others, although still categorized as small. This is followed by Human Resource Capacity (X_2), while Technology (X_3) shows the weakest direct effect on Y.

Table 8. F-Square Results (f^2 Effect Size)

Path	Original Sample (O)	Sample Mean (M)	P Values
X1 → Y	0.040	0.027	0.327
X2 → Y	0.014	0.012	0.874
X3 → Y	0.103	0.013	0.754

However, despite the small direct effects, these variables may still play a more substantial role through indirect mechanisms, particularly through mediation pathways within the structural model.

4.4. Discussion

The findings demonstrate that the sustainability of Change Actions following Administrator Leadership Training (PKA) is primarily determined by the interaction between organizational capabilities and technology-enabled institutional mechanisms. The structural model shows that Technology Utilization has a significant direct effect on the sustainability of Change Actions ($\beta = 0.421$, $p < 0.01$), whereas Leadership Support ($\beta = 0.236$, $p = 0.079$) and Human Resource Capacity ($\beta = 0.198$, $p = 0.123$) do not demonstrate significant direct effects. These findings indicate that supportive leaders and competent employees alone are insufficient to sustain organizational innovation unless their capabilities are embedded within technology-supported organizational systems.

This finding extends previous organizational change and digital transformation studies, which generally emphasize leadership, human capability, and technology as independent drivers of organizational performance. The present study provides a different perspective by demonstrating that technology functions as an institutional mechanism that transforms temporary Change Actions into sustainable organizational practices. In this context, technology is not merely an operational instrument but an organizational infrastructure that preserves knowledge, standardizes processes, facilitates coordination, and strengthens organizational continuity.

From the perspective of Socio-Technical Systems Theory (STS), sustainable organizational outcomes emerge from the interaction between social systems and technical systems rather than from either component independently. The findings strongly support this assumption. Leadership Support and Human Resource Capacity represent the social foundation of organizational change, while Technology Utilization represents the technical mechanism that enables these capabilities to become embedded within organizational routines.

Through digital systems, organizations can preserve organizational memory, institutionalize innovation processes, and maintain Change Actions despite leadership succession, employee rotation, and structural changes.

The significant influence of Technology Utilization has important implications for public-sector organizations. Government institutions frequently experience challenges related to personnel mobility, leadership turnover, and bureaucratic restructuring. Under such conditions, innovations that depend solely on individual actors are vulnerable to discontinuity. However, when Change Actions are integrated into digital platforms, workflow systems, and organizational information systems, innovation becomes part of institutional routines rather than personal initiatives. Therefore, technology should be considered a strategic infrastructure for sustaining public-sector transformation.

Regarding Leadership Support, the findings reveal that leadership does not directly influence sustainability but has a significant indirect effect through Technology Utilization ($\beta = 0.208$, $p = 0.010$). Thus, the direct hypothesis regarding leadership influence was not supported, while the mediation relationship was confirmed. This finding provides a more nuanced understanding of leadership in digital transformation contexts. Previous studies highlight that leaders establish vision, allocate resources, and motivate employees to embrace change. However, this study demonstrates that leadership influence becomes sustainable only when translated into technology-enabled organizational systems.

Technology provides continuity beyond individual leadership periods by embedding strategic initiatives into organizational processes. Digital documentation systems, workflow automation, knowledge repositories, and integrated information systems allow organizational practices initiated by leaders to continue after leadership transitions occur. This finding supports STS principles that sustainable organizational performance depends on the alignment between social capabilities and technical infrastructures.

Similarly, Human Resource Capacity does not have a significant direct effect on Change Action sustainability but demonstrates a significant indirect effect through Technology Utilization ($\beta = 0.180$, $p = 0.014$). This finding indicates that employee competence alone does not automatically guarantee sustainable innovation. Although human resources provide essential knowledge, skills, and adaptive capabilities, these resources may remain individual assets unless transformed into organizational capabilities through technological systems.

This finding extends Human Capital Theory, which emphasizes the value of employee knowledge and competence for organizational performance. The present study shows that human capital contributes to sustainability when technology enables organizations to capture, codify, and distribute employee knowledge. Digital knowledge management systems, electronic documentation, and collaborative platforms transform individual expertise into institutional knowledge, reducing dependence on specific employees.

These findings complement previous digital transformation research. Research emphasizes the importance of leadership and digital capability in transformation processes, while highlighting the role of technology in strengthening organizational performance. This study advances previous research by demonstrating that technology acts as the mediating mechanism through which organizational capabilities generate sustainable change.

The structural model further confirms the strength of the proposed Technology-Mediated Sustainability of Change (TMSC) framework. The model explains 75.2% of the variance in Change Action sustainability ($R^2 = 0.752$), indicating substantial explanatory power (Hair et al., 2022). Although the effect size of Technology Utilization is relatively small ($f^2 = 0.103$), its strategic importance is significant because it represents the only construct with a direct effect and the mechanism transmitting the influence of leadership and human resource capacity.

Theoretically, this study contributes by extending STS into the context of public-sector leadership development. Previous studies have often examined leadership, human resources, and technology separately. In contrast, the TMSC framework explains how these dimensions interact, where technology institutionalizes leadership initiatives and employee competencies into sustainable organizational practices. Therefore, the study shifts the focus from technology adoption toward technology-enabled institutionalization.

Practically, the findings suggest that leadership development programs should integrate digital transformation competencies into their curriculum. PKA participants should not only develop managerial competencies but also learn how to design Change Actions that are embedded within digital governance systems. Government institutions should strengthen digital knowledge management, innovation repositories, workflow systems, and technology-based performance monitoring to ensure that organizational innovations remain sustainable despite personnel changes.

Although this study focuses on Indonesian Administrator Leadership Training, the TMSC framework has broader relevance for public organizations undergoing digital transformation. Future studies may validate the framework in different governmental contexts and examine additional factors such as digital culture, innovation climate, organizational learning, and digital maturity. Longitudinal studies are also recommended to understand how technology continuously shapes the institutionalization of organizational change over time.

5. MANAGERIAL IMPLICATIONS

Theoretically, this study strengthens the development of the concept of technology-enabled organizational change, by showing that the sustainability of innovation is not only determined by leadership and Human Resource Capacity factors directly, but mediated by the organization's ability to adopt and integrate technology. These findings expand the perspectives of human capital theory and transformational leadership theory by placing technology as a key variable in the sustainability mechanism of public sector organizational change.

Practically, the results of this study show that training organizing agencies and government organizations need to prioritize strengthening the technology ecosystem in supporting the sustainability of Change Action. Leadership support and improvement of human resource competencies need to be directed at increasing digital literacy, the use of information systems, and the integration of technology in the organization's work process so that innovation does not stop at the training implementation stage, but can be institutionalized in a sustainable manner.

6. CONCLUSION

This study demonstrates that the sustainability of Change Actions following Administrator Leadership Training (PKA) is primarily influenced by Technology Utilization. While Leadership Support and Human Resource Capacity do not directly affect sustainability, they exert significant indirect effects through technology. These findings indicate that organizational change in the public sector is sustained not merely by capable leaders or competent employees, but through the successful institutionalization of innovation via digital systems.

Accordingly, this study proposes the Technology-Mediated Sustainability of Change (TMSC) framework. This framework extends Socio-Technical Systems Theory by explaining how technology transforms leadership support and human resource capacity into sustainable, long-term organizational practices.

From a practical perspective, the findings suggest that public organizations should prioritize digital governance, knowledge management systems, and technology-enabled workflows to preserve organizational innovation beyond leadership succession and staff rotation. Finally, future research should validate the TMSC framework across different public-sector contexts using longitudinal designs and incorporate additional factors such as digital maturity, organizational culture, and innovation climate to enhance its generalizability.

7. DECLARATIONS

7.1. About Authors

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7.2. Author Contributions

Conceptualization: AF and RR; Methodology: JM; Software: RR; Validation: AF; Formal Analysis: JM; Investigation: JM and RR; Resources: JM; Data Curation: JM and AF; Writing Original Draft Preparation: JM and RR; Writing Review and Editing: RR; Visualization: RR; All authors, JM, AF, and RR, have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The dataset used in this research can be obtained from the corresponding author upon request.

7.4. Funding

The authors did not receive any funding for the research, writing, or publication of this article.

7.5. Declaration of Conflicting Interest

The authors confirm that there are no conflicts of interest, financial or personal, that could have affected the results reported in this paper.

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