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Adaptive Scenario Planning for Madrasah Teacher Distribution in Greater Jakarta

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Abstract

Ensuring equitable teacher distribution remains a critical challenge in improving the quality of madrasah education in Indonesia, particularly in the Greater Jakarta (Jabodetabek) region. Existing allocation policies primarily rely on teacher–student ratios and often overlook institutional capacity, regional diversity, and contextual conditions. This study examines the factors influencing the effectiveness of madrasah teacher distribution and develops adaptive planning scenarios to support more responsive policy interventions. A quantitative research design was employed using Structural Equation Modeling (SEM) to analyze the effects of individual, organizational, and external environmental factors on teacher distribution management. The findings were subsequently integrated with the TAIDA (Tracking, Analysis, Imaging, Deciding, Acting) framework to formulate adaptive scenario-based planning models. The results reveal that organizational factors have the strongest influence on the effectiveness of teacher distribution, followed by individual and external environmental factors. The study demonstrates that distribution challenges are shaped by the interaction of governance structures, human resource characteristics, and contextual conditions rather than by teacher availability alone. Three adaptive scenarios were developed, ranging from administrative approaches to systemic adaptive models emphasizing organizational capacity, evidence-based planning, and regional responsiveness. The study contributes to educational management literature by integrating empirical modeling with strategic foresight to support equitable, flexible, and sustainable teacher distribution policies.

Keywords: Madrasah Teacher Distribution; Adaptive Planning; Scenario Planning; TAIDA Framework; Structural Equation Modeling; Educational Governanc.

ABSTRAK

Memastikan distribusi guru yang adil tetap menjadi tantangan penting dalam meningkatkan kualitas pendidikan madrasah di Indonesia, khususnya di wilayah Jakarta Raya (Jabodetabek). Kebijakan alokasi yang ada terutama bergantung pada rasio guru-murid dan sering mengabaikan kapasitas kelembagaan, keragaman regional, dan kondisi kontekstual. Studi ini meneliti faktor-faktor yang memengaruhi efektivitas distribusi guru madrasah dan mengembangkan skenario perencanaan adaptif untuk mendukung intervensi kebijakan yang lebih responsif. Desain penelitian kuantitatif digunakan dengan menggunakan Structural Equation Modeling (SEM) untuk menganalisis pengaruh faktor individu, organisasi, dan lingkungan eksternal terhadap manajemen distribusi guru. Temuan tersebut kemudian diintegrasikan dengan kerangka kerja TAIDA (Tracking, Analysis, Imaging, Deciding, Acting) untuk merumuskan model perencanaan berbasis skenario adaptif. Hasil penelitian menunjukkan bahwa faktor organisasi memiliki pengaruh terkuat terhadap efektivitas distribusi guru, diikuti oleh faktor individu dan lingkungan eksternal. Studi ini menunjukkan bahwa tantangan distribusi dibentuk oleh interaksi struktur tata kelola, karakteristik sumber daya manusia, dan kondisi kontekstual, bukan hanya oleh ketersediaan guru saja. Tiga skenario adaptif dikembangkan, mulai dari pendekatan administratif hingga model adaptif sistemik yang menekankan kapasitas organisasi, perencanaan berbasis bukti, dan responsivitas regional.

Studi ini berkontribusi pada literatur manajemen pendidikan dengan mengintegrasikan pemodelan empiris dengan pandangan strategis untuk mendukung kebijakan distribusi guru yang adil, fleksibel, dan berkelanjutan.
Kata kunci: *Distribusi Guru Madrasah; Perencanaan Adaptif; Perencanaan Skenario; Kerangka Kerja TAIDA; Pemodelan Persamaan Struktural; Tata Kelola PendidikanABSTRAK*

INTRODUCTION

Ensuring equitable access to quality education remains a major challenge in the management of madrasah education in Indonesia, particularly in the Greater Jakarta (Jabodetabek) area. Although the overall number of teachers is relatively sufficient, their distribution across regions, educational levels, and subject areas remains uneven. Disparities in teacher–student ratios, mismatches between teachers' qualifications and teaching assignments, and unequal workload distribution continue to affect instructional effectiveness and institutional performance.

Current teacher distribution policies in Indonesia predominantly rely on national ratio-based allocation models. While these approaches are useful for macro-level planning, they often fail to capture regional differences in institutional capacity, demographic conditions, and local educational needs. Consequently, teacher allocation decisions may not adequately address disparities at the school and district levels. This limitation suggests that teacher distribution should be viewed not merely as a quantitative allocation issue but as a complex policy challenge shaped by organizational, individual, and environmental conditions.

Previous studies have examined teacher shortages, surplus distribution, and teacher–student ratio imbalances. However, most focus on descriptive or static allocation models and provide limited guidance for anticipating future uncertainties or adapting policies to changing regional contexts. Few studies integrate empirical analysis of the determinants of teacher distribution with scenario-based planning approaches that can support adaptive policymaking. This gap is particularly relevant in the context of madrasah education, where institutional diversity and regional variation require more flexible planning mechanisms.

To address this gap, the present study combines Structural Equation Modeling (SEM) and the TAIDA (Tracking, Analysis, Imaging, Deciding, Acting) scenario planning framework. SEM is employed to examine the influence of individual, organizational, and external environmental factors on the effectiveness of teacher distribution, while TAIDA is used to translate empirical findings into adaptive policy scenarios for future planning. This integrated approach moves beyond conventional ratio-based models by linking evidence-based analysis with strategic foresight.

In this study, teacher distribution management is defined as the process of planning, placement, and allocation designed to achieve competency alignment, balanced workload, and institutional effectiveness. The analysis focuses on three key determinants: individual factors, organizational factors, and external environmental conditions, which collectively influence the effectiveness of teacher distribution within madrasahs.

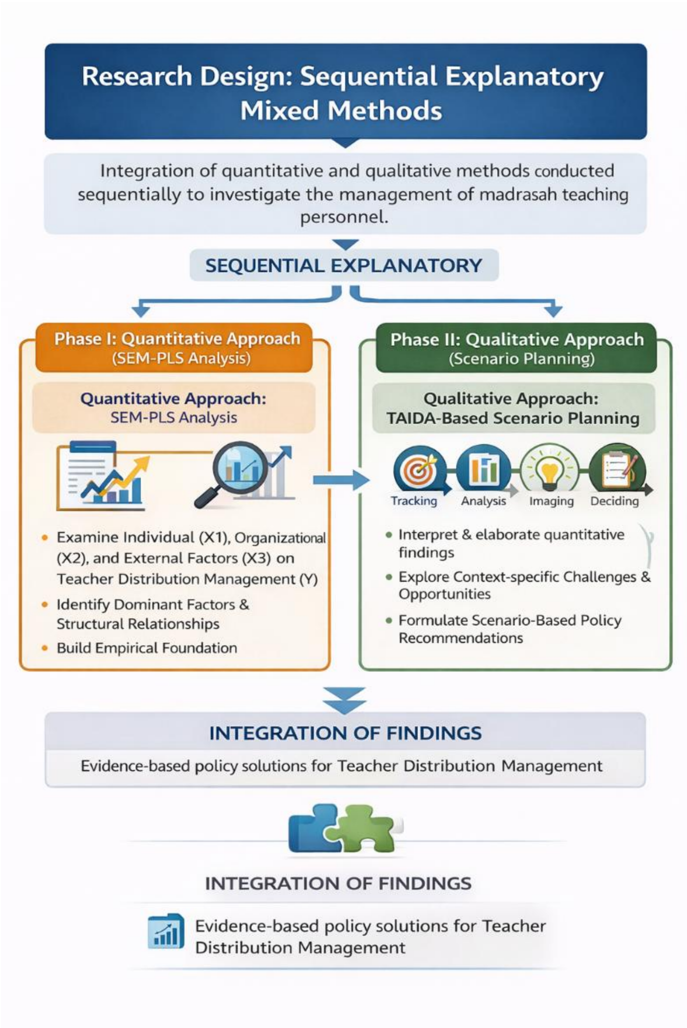
This study analyzes the influence of individual, organizational, and external environmental factors on the effectiveness of madrasah teacher distribution across regions and educational levels, examines the implications of distribution effectiveness for workload balance and educational quality, and develops adaptive scenario-based planning models for madrasah teacher distribution in the Greater Jakarta area using the TAIDA (Tracking, Analyzing, Imaging, Deciding, and Acting) framework to support evidence-based policy formulation and sustainable human resource management in madrasah education.

By integrating empirical modeling with strategic foresight, this study contributes to the teacher distribution literature in two ways. First, it identifies the relative influence of key determinants affecting distribution effectiveness in madrasahs. Second, it proposes an adaptive, scenario-based policy framework that supports regionally responsive planning and addresses the limitations of conventional national ratio-based allocation approaches.

METHOD

This study used a quantitative approach with a survey of educators and madrasah administrators in the Greater Jakarta area. The target population in this study is all madrasah teachers at the RA, MI, MTs, and MA levels in the Jabodetabek area, with a total of 53,904 educators, based on the EMIS data of the Ministry of Religion in 2023. Based on the calculation using the Slovin formula, it is known that the number of respondents in this study is 399 respondents who are madrasah educators/teachers at the RA, MI, MTs, and MA education levels, data collection techniques using research questionnaires.

Data analysis was conducted using Structural Equation Modeling (SEM) to examine the causal relationship between individual condition (X1), organizational (X2), and external environmental (X3) variables on the effectiveness of educator distribution (Y). Model feasibility was tested using goodness-of-fit indicators such as Chi-square and RMSEA. The SEM results were then integrated into the TAIDA scenario planning framework to formulate a policy scenario for educator distribution.



Source: Processed by the author using Artificial Intelligence (AI) technology, 2026.

Figure. 1. Research Design

RESULTS AND DISCUSSION

Establishing a Structural Model

A structural model refers to the relationships between latent variables in a study. This model includes paths or relationships between latent variables and is used to test hypotheses and analyze the direct and indirect influences between variables. The structural model in this study is a constellation of models built based on existing grand theories to verify whether the theories are still relevant or whether further developments have occurred.

The variables involved in this study's structural model are the Teacher Distribution Management variable (Y) as the endogenous variable, the Individual Circumstances variable (X1), the Organizational (X2), and the External Environment (X3) as the exogenous variables. The following is a depiction of the structural model developed.

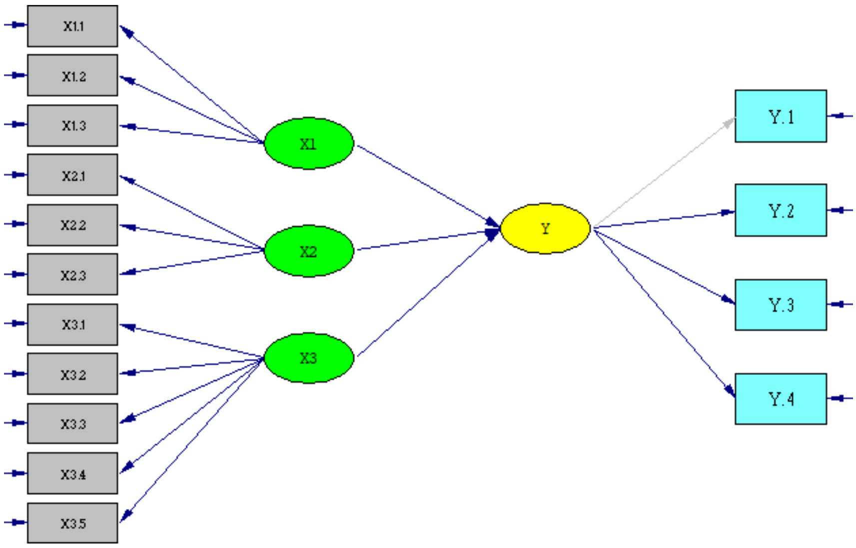


Figure 2. Stuctur Model

Establishing the Measurement Model (Outer Model)

The structural model describes the relationships between latent variables (constructs). Conversely, the measurement model reflects the relationships between constructs and their corresponding indicators in SEM, referred to as the outer model (Ringle, 2021). In this study, all latent variables/constructs have reflective indicators, meaning that each construct reflects its indicators.

Measurement Model for the Teacher Distribution Management Variable (Y) The Teacher Distribution Management variable (Y) is measured in a second-order manner and is measured by four indicators: (1) Education Possession, measured by two items; (2) Job Knowledge, measured by two items; (3) Job Skills, measured by three items; and (4) Work Experience, measured by two items. The following is the measurement model for the Teacher Distribution Management variable (Y).

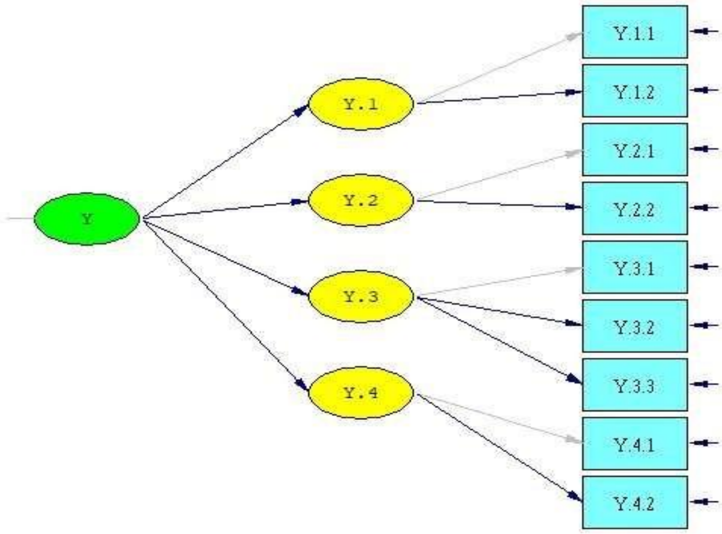


Figure. 3. Measurement model of the variable Management of Educational Personnel Distribution (Y)
along with indicators and measurement items

Measurement Model for the Individual Condition (X1)

The Individual Condition (X1) is measured in a second-order manner using three indicators: (1) Intellectual Ability, measured by 7 reflective measurement items, (2) Physical and psychological abilities, measured by 3 items, and (3) Motivation, measured by 4 items. The following is the measurement model for the Individual Condition (X1).

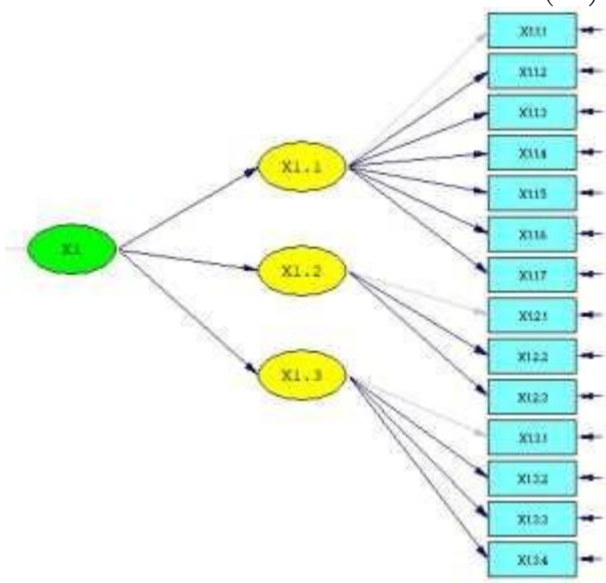


Figure 4. Measurement model for the Individual Condition variable (X1) along with indicators and measurement items

Measurement Model for the Organizational Variable (X2)

The Organizational Variable (X2) is measured using a second-order factor and is measured by three indicators: (1) Systems and Rules, measured by two items; (2) Leadership Behavior, measured by three items; and (3) Organizational Climate, measured by five items. The following is the measurement model for the Organizational Variable (X2).

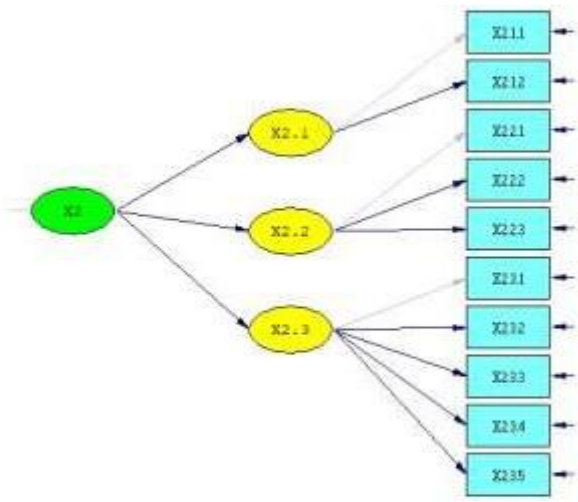


Figure. 5 Measurement model for the Organization variable (X2) along with indicators and measurement items

Measurement Model for the External Environmental Variable (X3)

The External Environmental Variable (X3) is measured using first-order factors using five indicators: (1) Social Component, (2) Economic Component, (3) Political Component, (4) Legal Component, and (5) Technological Component. The following is the measurement model for the External Environmental Variable (X3).

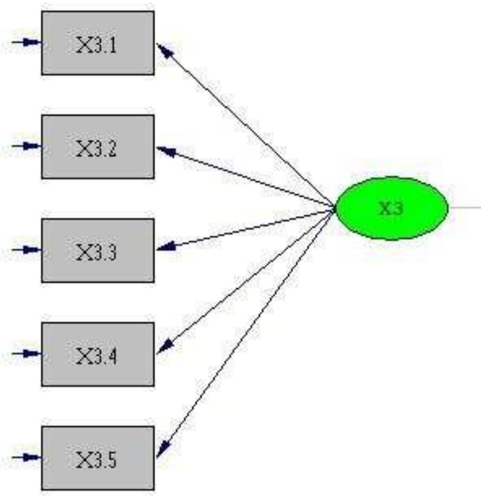


Figure 6. Measurement model for the External Environment variable (X3) along with indicators and measurement items

SEM Path Model Estimation

Model estimation in Structural Equation Modeling (SEM) refers to the process of calculating the model parameters needed to estimate the relationships between variables in a structural model. This estimation is performed using empirical data collected from the sample studied. The goal of model estimation is to produce a model that provides a good understanding of the relationships between variables within the established model constellation.

Measurement Model Analysis

This study uses the Embedded Two-Stage method, a hierarchical component model (HCM) approach. Therefore, the outer model assessment at this stage is the first-order assessment, which involves assessing the relationship between the measurement items (question items) and the indicators of the latent variables (constructs). Furthermore, the second-order stage involves measuring the relationship between the indicators and the latent variables

Outer Model Analysis Stage 1

Outer model analysis using reflective measurement items was conducted by testing validity and reliability. Validity was assessed using the Loading Factor and Average Variance Extracted (AVE) values. The criterion for each measurement item was a Loading Factor value > 0.7. However, according to Chin (in Ghozali, 2021), for exploratory research, a Loading Factor value of 0.6–0.7 is acceptable. Meanwhile, the Average Variance Extracted (AVE) value must be > 0.5. Furthermore, reliability was assessed using a Composite Reliability (CR) value > 0.7 (Ghozali, 2021; Hair et al., 2017).

Outer Model Analysis of the Teacher Distribution Management Variable (Y)

The results of the outer model of the Teacher Distribution Management variable (Y) using Lisrel are as follows:

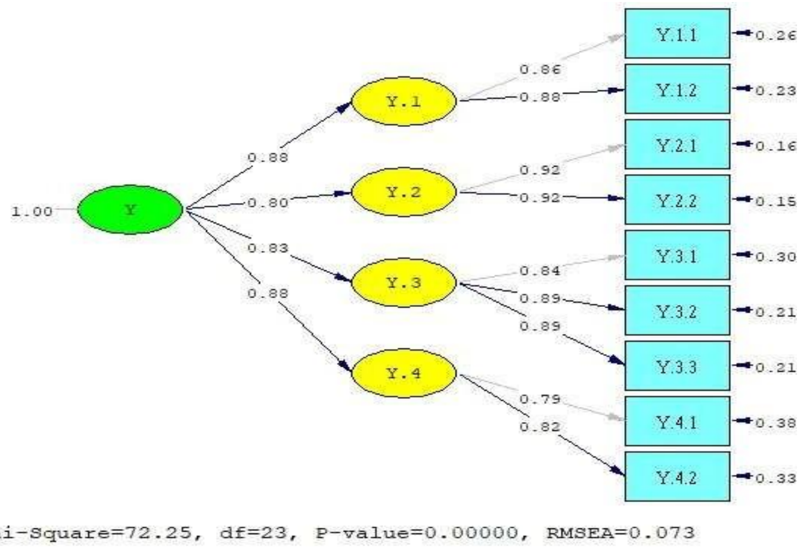


Figure 7. CFA Construct of the Teacher Distribution Management Variable (Y)

Based on Figure 7, it can be seen that all loading factor values are above 0.7 (>0.7), so the measurement items meet the criterion, namely a loading factor value >0.7. Because the loading factor values meet the criterion, all measurement items are greater than 0.7, so no reduction process is necessary. The following is a summary of the Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) values for the Teacher Distribution Management variable (Y).

Table 1. Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) Values for Stage 1 of the Measurement Items and Indicators for the Teacher Distribution Management variable (Y).

Variabel	Indikator	*Standardized Factor Loading*	SFL Kuadrat (Persepsi)	Error [εj]	Construct Reliability	Cronbach Alpha
Y.1	Y.1.1	0.86	0.740	0.260		

	Y.1.2	0.88	0.774	0.226	0.862	0.913
Total		**1.740**	**1.514**	**0.486**		
Y.2	Y.2.1	0.92	0.846	0.154		
	Y.2.2	0.92	0.846	0.154	0.917	0.876
Total		**1.840**	**1.693**	**0.307**		
	Y.3.1	0.84	0.706	0.294		
Y.3	Y.3.2	0.89	0.792	0.208	0.906	0.850
	Y.3.3	0.89	0.792	0.208		
Total		**2.620**	**2.290**	**0.710**		
Y.4	Y.4.1	0.79	0.624	0.376		
	Y.4.2	0.82	0.672	0.328	0.787	0.850
Total		**1.610**	**1.297**	**0.704**		

Source: Data Processed by Lisrel and Excel

Based on Table 1, all measurement item values, or loading factor values, are >0.7. Therefore, these values are considered valid as they meet the criteria. The Average Variance Extracted (AVE) value also meets validity requirements, as all indicators have an AVE value >0.5. Similarly, the Composite Reliability (CR) value shows that all indicators have a value >0.7, thus meeting reliability requirements. Therefore, the Outer Model measurement for the Teacher Distribution Management variable (Y) can proceed to the next stage as it meets validity and reliability requirements.

Outer Model Analysis of the Individual Condition (X1)

The results of the outer model of the Individual Condition (X1) using the LISREL 8.80 application are as follows:

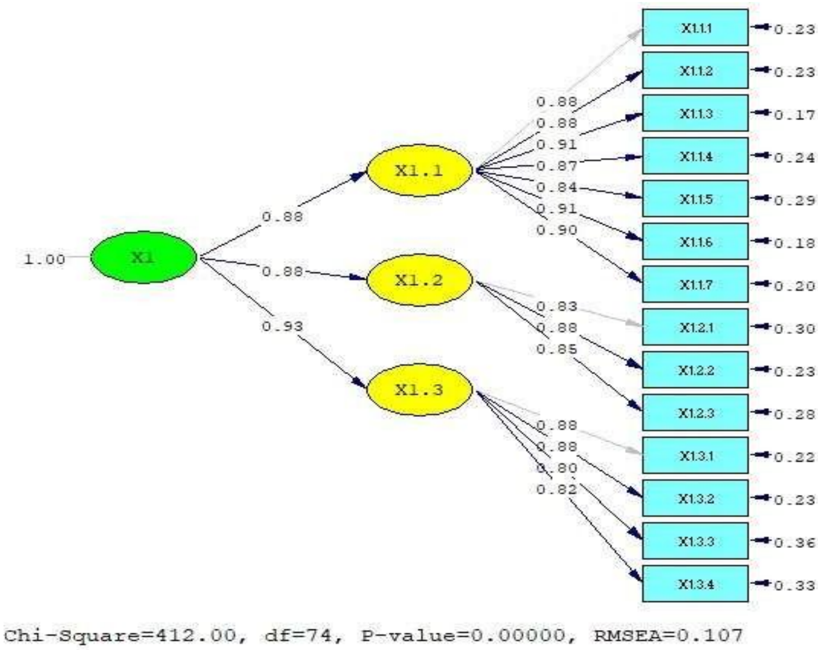


Figure 8. CFA Construct for the Individual Condition (X1)

Figure 8 shows that all loading factor values are above 0.7 (>0.7), so the measurement items meet the criterion of a loading factor value >0.7. Because the loading factor values meet the criterion, all measurement items exceed 0.7, and no reduction process is necessary.

The following is a summary of the Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) values for the Individual Condition (X1).

Table 2. Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) Values for Stage 1 of the Measurement Items and Indicators for the Individual Condition (X1)

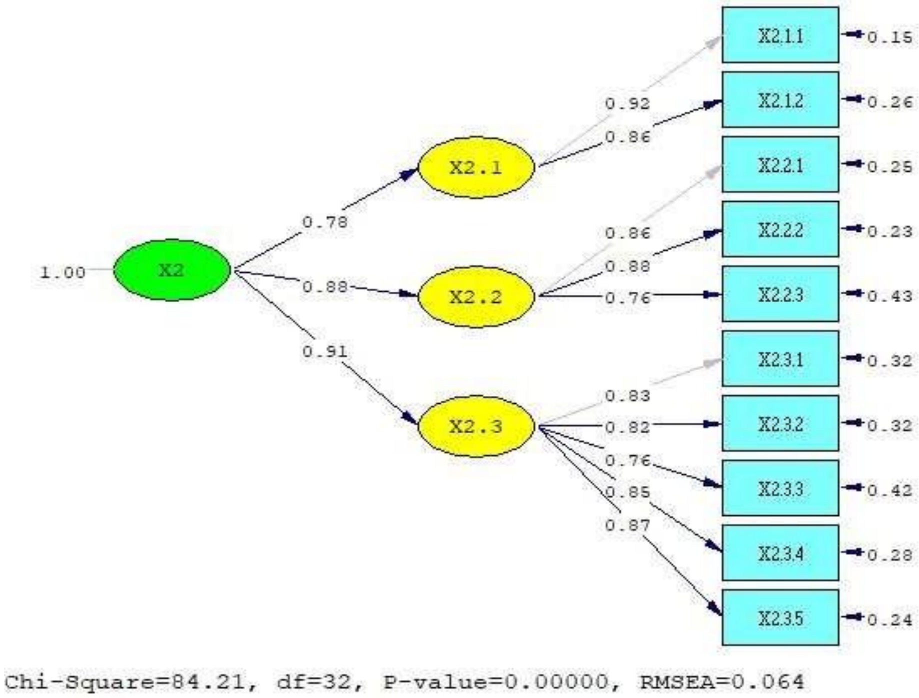
Variabel	**Indikator**	***Standardized Factor Loading***	**SFL Kuadrat (Persepsi)**	**Error [εj]**	**Construct Reliability**	**Cronbach Alpha**	**AVE**
X1.1	X1.1.1	0.88	0.774	0.226	0.962	0.913	0.783
	X1.1.2	0.88	0.774	0.226			
	X1.1.3	0.91	0.828	0.172			
	X1.1.4	0.87	0.757	0.243			
	X1.1.5	0.84	0.706	0.294			
	X1.1.6	0.91	0.828	0.172			
	X1.1.7	0.90	0.810	0.190			
Total	**6.190**	**5.478**	**1.523**				
	X1.2.1	0.83	0.689	0.311			
X1.2	X1.2.2	0.88	0.774	0.226			
	X1.2.3	0.85	0.723	0.278	0.889	0.876	0.729
Total	**2.560**	**2.186**	**0.814**				
	X1.3.1	0.88	0.774	0.226			
	X1.3.2	0.88	0.774	0.226			
X1.3	X1.3.3	0.80	0.640	0.360	0.909	0.850	0.715
	X1.3.4	0.82	0.672	0.328			
Total	**3.380**	**2.861**	**1.139**				

Source: Data Processed by Lisrel 8.80 and Excel

Based on Table 2, all measurement item values, or loading factors, are >0.7. Therefore, these values are considered valid because they meet the criteria. The Average Variance Extracted (AVE) value also meets the requirements, as all indicators have an AVE value >0.5. Similarly, the Composite Reliability (CR) value shows that all indicators have a value >0.7, thus meeting the reliability requirements. Therefore, the Outer Model measurement for the Individual Condition (X1) can proceed to the next stage because the Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) values all meet the criteria.

Outer Model Analysis of the Organizational Variable (X2)

The results of the outer model of the Organizational variable (X2) using LISREL 8.80 are as



follows:

Figure 9. CFA Construct of Organizational Variable (X2)

Based on Figure 9, it can be seen that all loading factor values are above 0.7 (>0.7), so the measurement items meet the criterion of a loading factor value >0.7. Because the loading factor values meet the criterion, all measurement items exceed 0.7, so no reduction process is necessary.

The following is a summary of the Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) values for the Organization variable (X2).

Table 3. Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) Values for Stage 1 of the Measurement Items and Indicators for the Organization variable (X2).

Variabel	**Indikator**	***Standardized Factor Loading***	**SFL Kuadrat (Persepsi)**	**Error [εj]**	**Construct Reliability**	**Cronbach Alpha**	**AVE**
X2.1	X2.1.1	0.92	0.846	0.154	0.884	0.913	**0.793**
	X2.1.2	0.86	0.740	0.260			
Total		**1.780**	**1.586**	**0.414**			
X2.2	X2.2.1	0.86	0.740	0.260	0.873	0.876	**0.697**
	X2.2.2	0.88	0.774	0.226			
	X2.2.3	0.76	0.578	0.422			
Total		**2.500**	**2.092**	**0.908**			
	X2.3.1	0.83	0.689	0.311			
	X2.3.2	0.82	0.672	0.328			

X2.3	X2.3.3	0.76	0.578	0.422	0.915	0.850	**0.684**
	X2.3.4	0.85	0.723	0.278			
	X2.3.5	0.87	0.757	0.243			
Total		**4.130**	**3.418**	**1.582**			

Source: Data Processed with Smart-PLS 4.0

Based on Table 3, all measurement item values, or loading factor values, are >0.7. Therefore, these values are considered valid and meet the criteria. The Average Variance Extracted (AVE) value also meets the requirements, as all indicators have an AVE value >0.5. Similarly, the Composite Reliability (CR) value shows that all indicators have a value >0.7, thus meeting the reliability requirements. Therefore, the Outer Model measurement for the Organization variable (X2) can proceed to the next stage because the Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) values all meet the criteria.
4 Outer Model Analysis of the External Environmental Variable (X3)
The results of the outer model for the External Environmental variable (X3) using LISREL 8.80 are as follows:

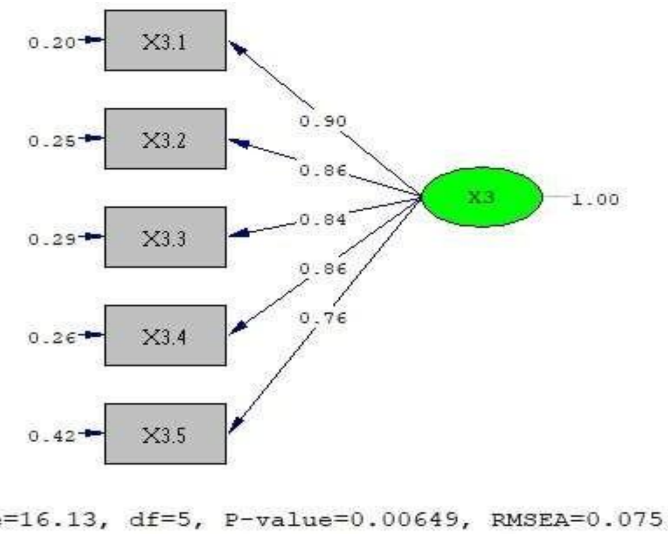


Figure 10. CFA Construct of the External Environment Variable (X3)

Figure 10, shows that all loading factor values are above 0.7 (>0.7), so the measurement items meet the criterion of a loading factor value >0.7. Because the loading factor values meet the criterion, all measurement items are greater than 0.7, so no reduction process is necessary.

The following is a summary of the Loading Factor, Composite Reliability (CR), and Average. Variance E.

Table 4. Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) values for Stage 1 of the measurement items and indicators of the External Environment variable (X3)xtracted (AVE) values for the External Environment variable (X3).

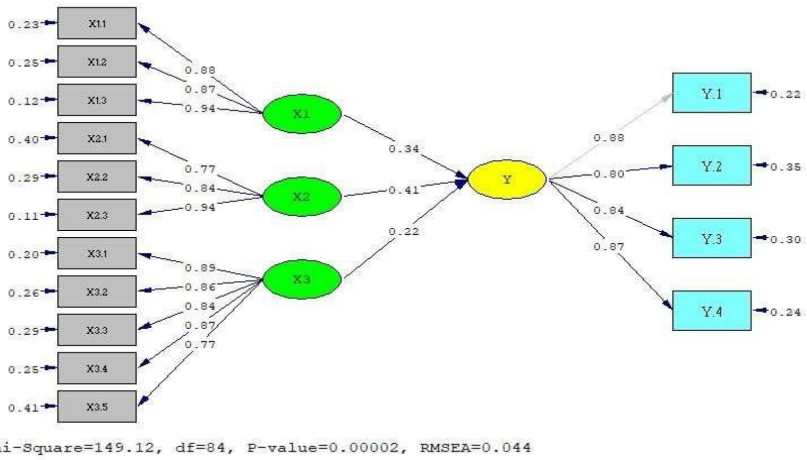
Variabel	Indikator	***Standardized Factor Loading***	**SFL Kuadrat (Persepsi)**	**Error [εj]**	**Construct Reliability**	**Cronbach Alpha**	**AVE**
X3	X3.1	0.9	0.810	0.190	0.926	0.913	**0.714**
	X3.2	0.86	0.740	0.260			
	X3.3	0.84	0.706	0.294			
	X3.4	0.86	0.740	0.260			
	X3.5	0.76	0.578	0.422			
Total		**4.220**	**3.572**	**1.428**			

Source: Data Processed with LISREL 8.80 and Excel

Based on Table 4.4, all measurement item values, or loading factor values, are >0.7. Therefore, these values are considered valid and meet the criteria. The Average Variance Extracted (AVE) value also meets the requirements, as all indicators have an AVE value >0.5. Similarly, the Composite Reliability (CR) value shows that all indicators have a value >0.7, thus meeting the reliability requirements. Therefore, the Outer Model measurement for the innovative behavior variable can proceed to the next stage because the Loading Factor, **Composite Reliability (CR), and Average Variance Extracted (AVE) values all meet the criteria.**

Outer Model Analysis, Stage 2

The outer model evaluation, Stage 2, was conducted on the variables measured by each indicator, which is a reflective type indicator. Model evaluation at this stage was conducted by extracting the Latent Variable value for each indicator from the calculation results using the PLS Algorithm in Stage 1 above. Evaluation of the measurement model at the high-order component (HOC) level for each exogenous and endogenous variable was conducted using a reflective approach. Evaluation of the measurement model with reflective indicators used Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) values



(Ghozali; 2021; Hair et al., 2017). The following chart shows the results using LISREL 8.80.

Figure 11. Output Chart of the Second-Order Outer Model Constellation of the Educational Staff Distribution Management Research Model

Figure 11 shows that all loading factor values are above 0.7 (>0.7), so the measurement items meet the criteria, namely a loading factor value >0.7. Because the loading factor values meet the criteria, all indicators are greater than 0.7, all indicators in the study can be used for further calculations. Composite Reliability (CR) and Average Variance Extracted (AVE) values can be seen in the following summary table 5.

Table 5. Summary of Loading Factor, Composite Reliability (CR), and Average Variance Extracted (AVE) Values in the Phase 2 Measurement Model

Variabel	Indikator	***Standardized Factor Loading***	**SFL Kuadrat (Persepsi)**	**Error [ε j]**	**Construct Reliability**	**Cronbach Alpha**	**AVE**
Y	Y.1	0.88	0.774	0.226	0.911	0.913	**0.719**
	Y.2	0.80	0.640	0.360			
	Y.3	0.84	0.706	0.294			
	Y.4	0.87	0.757	0.243			
Total		**3.390**	**2.877**	**1.123**			
X1	X1.1	0.88	0.774	0.226	0.925	0.850	**0.805**
	X1.2	0.87	0.757	0.243			
	X1.3	0.94	0.884	0.116			
Total		**2.690**	**2.415**	**0.585**			
X2	X2.1	0.77	0.593	0.407	0.888	0.876	**0.727**
	X2.2	0.84	0.706	0.294			
	X2.3	0.94	0.884	0.116			
Total		**2.550**	**2.182**	**0.818**			
X3	X3.1	0.89	0.792	0.208	0.927	0.807	**0.717**
	X3.2	0.86	0.740	0.260			
	X3.3	0.84	0.706	0.294			
	X3.4	0.87	0.757	0.243			
	X3.5	0.77	0.593	0.407			
Total		**4.230**	**3.587**	**1.413**			

Source: Data Processed with LISREL 8.80 and Excel

Based on Table 5, it is clear that all measurement items have Loading Factor values > 0.7, indicating they meet the criteria, meaning all measurement items are valid. Likewise, the Average Variance Extracted (AVE) values for all indicators are > 0.5, thus meeting the validity requirements. Furthermore, the Composite Reliability (CR) values for all indicators are > 0.7, thus also meeting the reliability requirements. Therefore, the Outer Model measurement has met the loading factor, composite reliability (CR), and average variance extracted (AVE) values, allowing for the next step.

Structural Model Analysis (Inner Model)

Inner Model analysis, or structural model analysis, is conducted to measure the extent of the relationship between the exogenous variables and the endogenous variables that have been constructed. This analysis provides an understanding of the strength of the relationship between the variables involved in the constructed model. The following are the results of the Inner Model analysis or structural model.

Normality Test

The normality test is used to determine whether the data distribution is normally distributed. Several parameters can be used in normality testing, namely multivariate normality, skewness, and kurtosis. In this study, the normality assumption was tested using skewness and kurtosis values. Data are considered normally distributed if the chi-square value for skewness and kurtosis is greater than a significant alpha of 5% or 0.05. The results of the normality test in this study are presented in Table 6 below:

Table 6. Normality Test Results

Aspek	Nilai	Z-Score	P-Value
Skewness	22,848	17,019	**0,000**
Kurtosis	280,045	8,518	**0,000**
Skewness & Kurtosis (Chi-Square)	**362,205**	**–**	**0,000**

Source: Data Processed with LISREL 8.80 and Excel

The results of the multivariate normality test indicate that the data are not normally distributed, as indicated by skewness and kurtosis values with a p-value <0.05. Therefore, this study used the Asymptotic Covariance Matrix (ACM) in the SEM estimation process to address violations of the normality assumption and obtain more robust parameter estimates.

Model Quality Test Results

Goodness of Fit (GOF) Structural Equation Model

In the SEM model, the measurement model and structural model parameters are estimated simultaneously and must meet the model fit requirements. Therefore, the model must be grounded in strong theory. The measurement model is considered fit if it meets three or four indices, with a minimum of each of the incremental and absolute indices being met (Hair et al., 2019). According to Hair et al. (2019), goodness of fit describes how well a defined theoretical structure represents the reality represented by the research data. The results of the estimation and model fit using the Lisrel 8.80 application program can be seen below:

Table 7 Goodness of Fit Results

Gof	Ukuran Kecocokan	Nilai Rujukan	Hasil Uji	Kecocokan
Absolut Fit Measure	GFI (Goodness of Fit)	GFI ≥ 0.90	0.95	***Good Fit***
	RMSEA(Root Mean square Error of Approximation)	RMSEA ≤ 0.08	0.044	***Good Fit***
	Satndardized Root Mean Square Residual (SRMR)	SRMR ≤ 0.08	0.022	***Good Fit***
	Normed Chi-Square	CMIN/DF ≤ 2.00	1.938	***Good Fit***
Incremental Fit Measur	**Normed Fit Index (NFI) Tucker Lewis**	**NFI ≥ 0.90**	**0.99**	***Good Fit***

e	Index

Source: Data Processed with LISREL 8.80 and Excel

Table 7 shows that all goodness of fit criteria for the Absolute Fit Measure and the Incremental Fit Measure have been met, indicating that the evaluation results indicate a very good model.

Coefficient of Determination (R2)

The coefficient of determination (R-Square) is a method for assessing the extent to which an endogenous construct can be explained by an exogenous construct. The coefficient of determination (R-Square) value ranges from 0 to 1. An R-Square value of 0.75 indicates substantial (strong), a value of 0.50 indicates moderate, and a value of 0.25 indicates weak (Hair et al., 2022). The coefficient of determination (R-Square) values are shown in Table 4.19 below:

Table 8 R-Square Value Results

Dependent Variable	R Square
Educator Distribution Management (Y	0.82

Source: Data Processed with LISREL 8.80 and Excel

The R Square value for the simultaneous or simultaneous influence of the variables of Individual Condition (X1), Organization (X2), and External Environment (X3) on the Management of the Distribution of Educators (Y) is 0.82. Therefore, it can be explained that all exogenous constructs (Individual Condition (X1), Organization (X2), and External Environment (X3)) simultaneously influence the Management of the Distribution of Educators (Y) by 0.82 or 82%. Because the R square is smaller than 70%, the influence of all exogenous constructs of Individual Condition (X1), Organization (X2), and on the Management of the Distribution of Educators (Y) is strong.

Path Significance Analysis

Path Significance Analysis is used to test whether exogenous variables influence endogenous variables. The test criteria state that if the T-statistic value is greater than the T-table (1.96), then there is a significant influence of the exogenous variable on the endogenous variable. The results of the significance test and the model can be seen in the following figure and table.

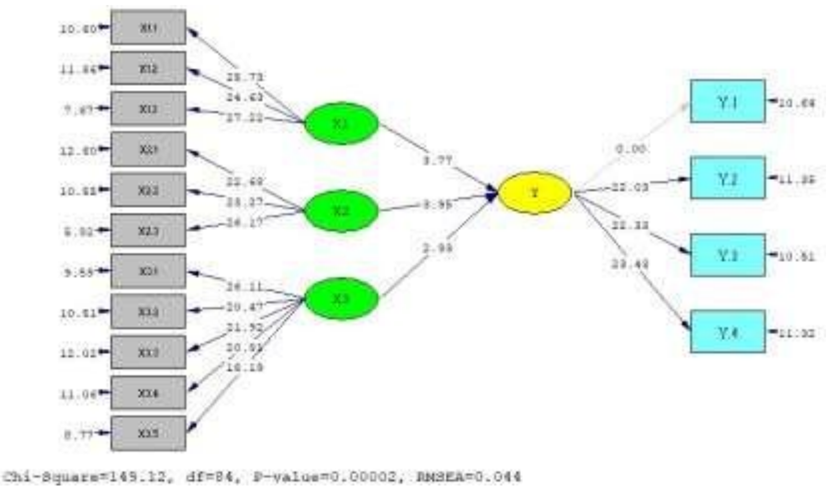


Figure 12. T-Statistics in the Teacher Distribution Management Model (Y)

Table 9. Hypothesis Testing Results

Influence	Coefficient	T Statistics (|O/STDEV|)	Description
Individual Condition (X1) -> Teacher Distribution Management (Y)	0.34	3.77	**Significant**
Organization (X2) -> Teacher Distribution Management (Y)	0.41	3.95	**Significant**
External Environment (X3) -> Teacher Distribution Management (Y)	**0.22**	**2.93**	**Significant**

Source: Data Processed with LISREL 8.80 and Excel

Based on Table 4.9, the following explanation can be obtained:

The Influence of Individual Condition (X1)on Teacher Distribution Management (Y)

The test of the influence of Individual Condition (X1)on Teacher Distribution Management (Y) yielded a T-statistic of 3.77. The test results indicate that the T-statistic value is > 1.96. This indicates a significant influence of Individual Condition (X1)on Teacher Distribution Management (Y). The resulting coefficient is positive at 0.34. This means that the better the Individual Circumstances (X1), the better the Teacher Distribution Management (Y). Therefore, the hypothesis is accepted.

The Influence of Organization (X2) on Teacher Distribution Management (Y)

The test of the influence of Organization (X2) on Teacher Distribution Management (Y) yielded a T-statistic of 3.95. The test results indicate that the T-statistic value is > 1.96. This indicates a significant influence of Organization (X2) on Teacher Distribution Management (Y). The resulting coefficient is positive, at 0.41. This means that the better the organization (X2), the more likely it is to improve the management of teacher distribution (Y). Therefore, the hypothesis is accepted.

The influence of the external environment (X3) on the management of teacher distribution (Y).

The test of the influence of the external environment (X3) on the management of teacher distribution (Y) yielded a T-statistic value of 2.93. The test results indicate that the T-statistic value is greater than 1.96. This indicates that there is a significant influence of the external environment (X3) on the management of teacher distribution (Y). The resulting coefficient is positive, at 0.22. This means that the better the external environment (X3), the more likely it is to improve the management of teacher distribution (Y). Therefore, the hypothesis is accepted.

Model Comparison

Model comparison aims to determine whether a model has superior predictive ability compared to the benchmark model, in this case, Constellation 1-3. The following are the comparison results for Constellation 1-3 models.

1. Main Model

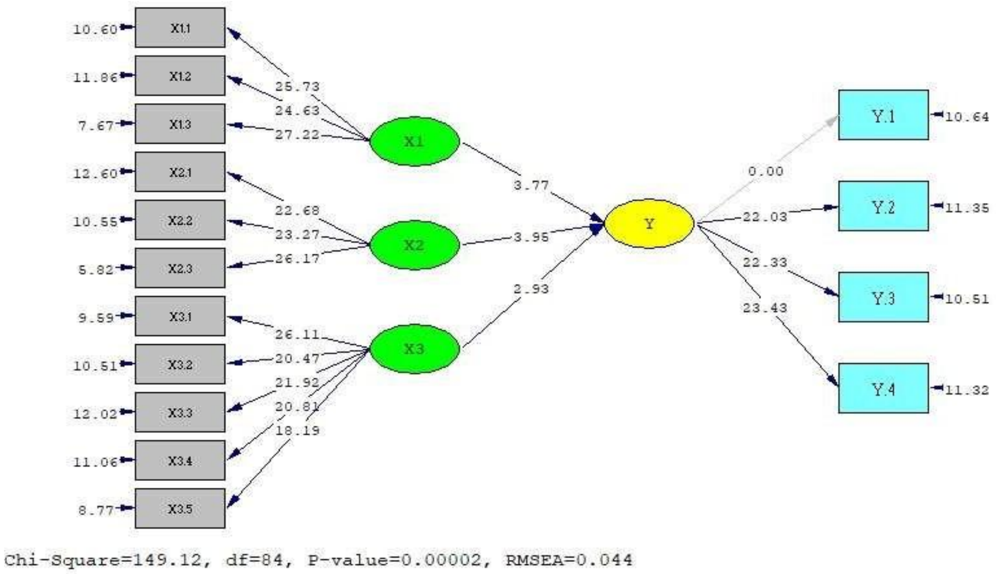


Figure. 13 Main Model Constellation

Constellation Model 1

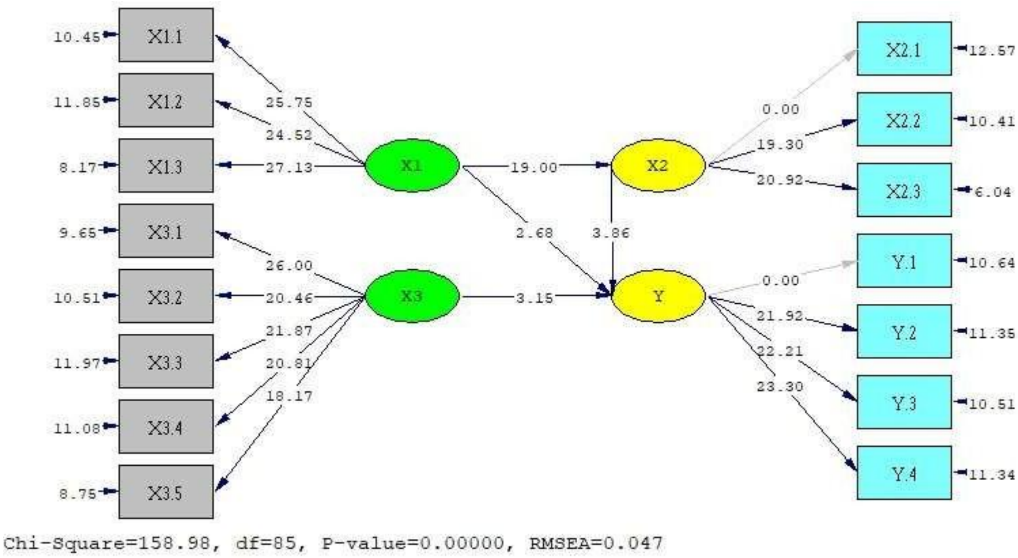


Figure. 14 Model Constellation One

Constellation Model 2

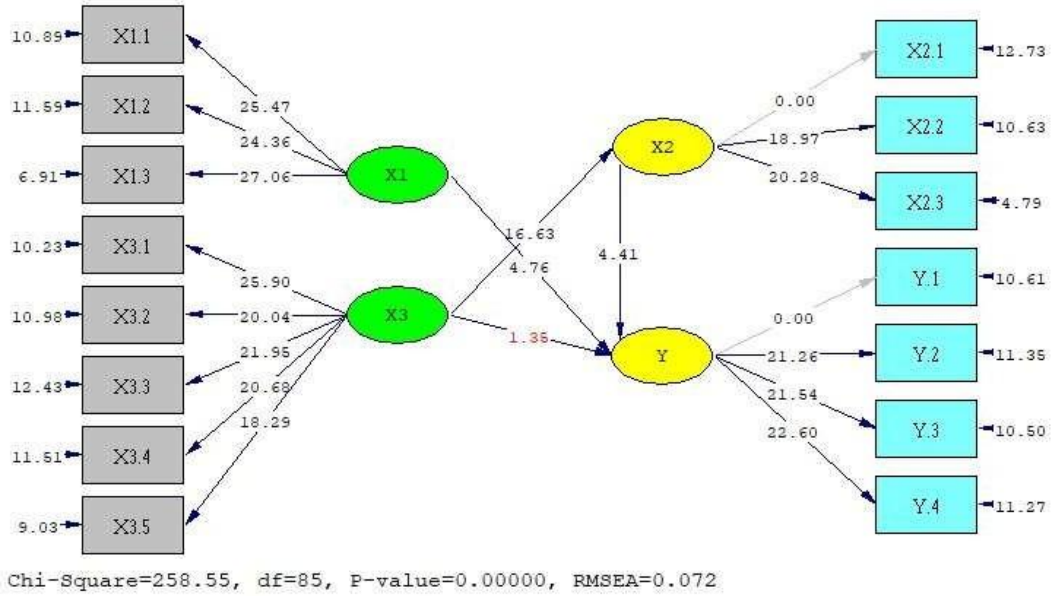
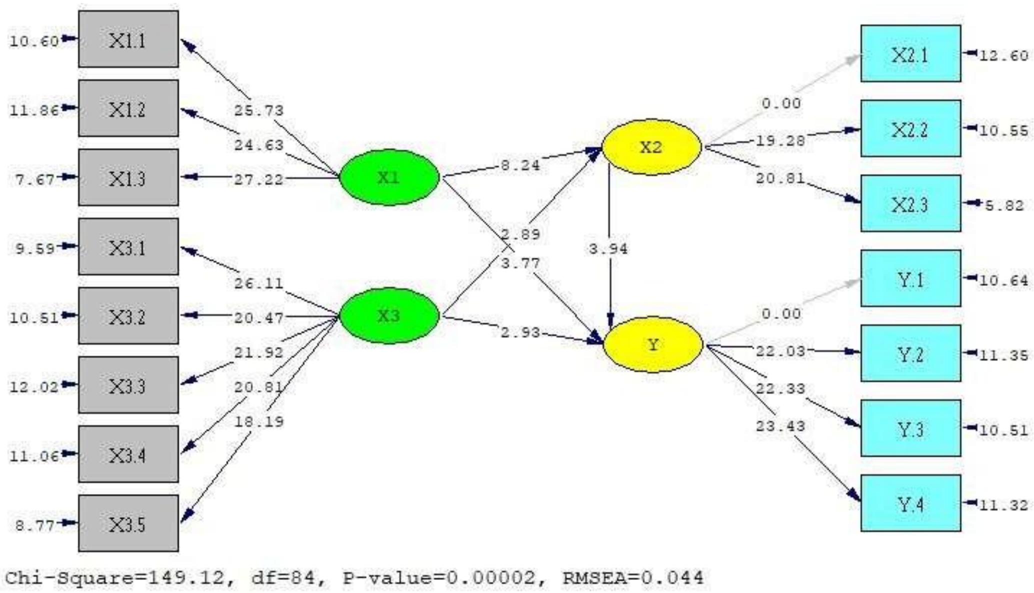


Figure. 15 Model Constellation Twoo



Constellation Model 3

Fig. 16 Model Constellation Three

Table 10. Summary of Comparison Test Results for Main and Constellation Models 1-3

Constellation	R^2	Chi Square/DF	RMSEA	Significant Paths (p<0.05)
Utama	0.82	1.775	0.044	**All Paths Significant**
Model 1	0.83	1.870	0.047	**All Paths Significant**
Model 2	0.82	3.042	0.072	**One insignificant path**
Model 3	**0.82**	**1.775**	**0.044**	**All Paths Significant**

This study tested four constellation models: the Main Model and three comparison models (Models 1–3). Comparisons were based on R^2, Chi-Square/DF, path significance, and RMSEA.

Based on the table above, all tested constellation models demonstrated relatively high R^2 values, ranging from 0.82–0.83, indicating that the models were able to explain 82%–83% of the variation in the dependent variable. This demonstrates the model's strong explanatory power. In terms of goodness of fit, the Chi-Square/DF values for the Main Model, Model 1, and Model 3 were below the maximum limit of 2.00, indicating a good level of fit. The RMSEA values for all three models were also below 0.05, thus categorizing them as good fit. Conversely, Model 2 demonstrated a Chi-Square/DF value of 3.042 and an RMSEA of 0.072, which, while still within the acceptable fit limits, were lower than the other models. Furthermore, in Model 2, one path was found to be insignificant ($p > 0.05$), indicating that the relationship structure in this model is less than optimal. Therefore, the Main Model, or Model 3, is recommended as the final model in this study.

Overall, The measurement model assessment confirmed that all constructs satisfied validity and reliability requirements. All loading factors exceeded the recommended threshold of 0.70, Average Variance Extracted (AVE) values were above 0.50, and Composite Reliability (CR) values exceeded 0.70. These results indicate that the indicators adequately represent their respective latent constructs.

The structural model also demonstrated satisfactory fit. The model achieved acceptable goodness-of-fit indices (GFI = 0.95; RMSEA = 0.044; SRMR = 0.022; CMIN/DF = 1.938; NFI = 0.99), indicating consistency between the theoretical model and the observed data. The coefficient of determination ($R^2 = 0.82$) shows that individual, organizational, and external environmental factors jointly explain 82% of the variance in teacher distribution management effectiveness.

Hypothesis testing revealed that all proposed relationships were positive and statistically significant. Organizational factors exerted the strongest influence on teacher distribution management ($\beta = 0.41$; $t = 3.95$), followed by individual factors ($\beta = 0.34$; $t = 3.77$) and external environmental factors ($\beta = 0.22$; $t = 2.93$). These findings indicate that improvements in organizational systems, leadership, and coordination mechanisms contribute most substantially to effective teacher distribution.

Model comparison further confirmed that the main model provided the most robust explanatory structure, with all paths remaining significant and overall fit indices outperforming alternative constellations.

Discussion

The results indicate that organizational factors are the most influential determinant of effective madrasah teacher distribution, followed by individual and external environmental factors. This finding suggests that teacher distribution is fundamentally a governance and management issue rather than merely a staffing problem. Although teacher availability remains important, the effectiveness of distribution depends largely on how educational organizations plan, coordinate, monitor, and adapt resource allocation across different contexts.

The dominant role of organizational factors supports educational management theories that emphasize organizational capacity as a critical determinant of policy implementation effectiveness. According to Hallinger and Kovačević (2021), educational outcomes are strongly influenced by institutional leadership, organizational structures, and decision-making processes that shape how resources are allocated and utilized. Similarly, adaptive governance literature argues that public organizations facing complex and uncertain environments require flexible coordination mechanisms and data-driven planning systems rather than rigid administrative procedures (Ansell & Gash, 2021). The significant organizational effect identified in this study suggests that teacher distribution inequalities are often symptoms of limitations in planning systems, coordination structures, and institutional governance rather than a simple shortage of personnel.

The findings also align with contemporary workforce planning research, which views teacher allocation as a strategic human resource management function. Santiago et al. (2021) argue that effective teacher deployment requires aligning workforce competencies with institutional needs while simultaneously considering career development opportunities and professional preferences. In many education systems, unequal teacher distribution persists despite adequate teacher supply because workforce planning mechanisms fail to integrate competency mapping, performance management, and regional demand forecasting. The present study supports this perspective by demonstrating that organizational systems exert greater influence on distribution effectiveness than individual teacher characteristics alone.

The significant influence of individual factors further reinforces the importance of strategic human resource management in education. Teacher competence, motivation, and professional aspirations shape willingness to accept placements, adapt to institutional environments, and sustain performance in challenging locations. Recent studies have shown that teacher retention and deployment decisions are influenced not only by financial incentives but also by perceptions of professional growth, organizational support, and work-life balance (OECD, 2023; UNESCO, 2024). Therefore, distribution policies that rely exclusively on administrative assignment mechanisms may have limited effectiveness if they fail to address motivational and professional development considerations.

From the perspective of human capital theory, teachers represent a strategic asset whose value depends on both their competencies and their alignment with organizational needs. As Becker's human capital framework has been extended in contemporary educational research, effective deployment is increasingly understood as a process of optimizing the utilization of professional expertise across institutions rather than merely filling vacancies (Schleicher, 2023). The positive relationship between individual factors and distribution effectiveness found in this study supports this argument and highlights the need for competency-based deployment policies.

External environmental factors also demonstrate a significant, although comparatively smaller, influence on teacher distribution management. This finding is consistent with policy implementation theory, which emphasizes that policy outcomes are shaped by contextual conditions including infrastructure, local government support, socioeconomic characteristics, and regional accessibility (Peters, 2021). Educational organizations do not operate in isolation; rather, they function within broader governance ecosystems that either facilitate or constrain policy implementation. Consequently, teacher deployment strategies that ignore local contextual conditions may produce unintended inequalities despite being administratively compliant with national regulations.

The significance of environmental factors further supports adaptive governance theory, which emphasizes the need for policy systems capable of responding to changing contextual conditions and uncertainty (Howlett, 2023). Rapid urbanization, population mobility, demographic shifts, and technological development continue to reshape educational demand across metropolitan regions such as Greater Jakarta. Under such circumstances, static teacher allocation models based solely on teacher–student ratios become increasingly inadequate because they cannot capture evolving local realities. This finding reinforces the argument that teacher distribution policies should incorporate regional data, demographic projections, and contextual indicators into planning processes.

An important contribution of this study lies in demonstrating that teacher distribution effectiveness emerges from the interaction of organizational, individual, and environmental dimensions. Previous research has largely focused on teacher shortages, surplus distribution, or teacher–student ratios as primary indicators of distribution effectiveness (UNESCO, 2023; World Bank, 2024). While such measures remain important, they often treat teacher distribution as a technical allocation problem. The present findings suggest that distribution challenges are better understood as systemic issues involving multiple interconnected determinants. This perspective aligns with systems theory, which views educational organizations as complex adaptive systems where outcomes emerge from interactions among actors, institutions, and contextual environments (Mason, 2021).

The findings also provide empirical support for the use of adaptive planning approaches in educational workforce management. The strong explanatory power of the SEM model (R^2 = 0.82) indicates that organizational, individual, and environmental factors collectively explain a substantial proportion of distribution effectiveness. These empirical relationships serve as the foundation for the TAIDA scenario planning framework applied in this study. The Tracking stage identifies key drivers of distribution inequality, while the Analysis stage reveals the relative influence of each factor through SEM path coefficients. The Imaging stage translates these findings into a desired future condition characterized by equitable teacher allocation and balanced workloads. Subsequently, the Deciding and Acting stages prioritize organizational reforms, incentive systems, and regional collaboration mechanisms according to the relative importance of each determinant.

The integration of SEM and TAIDA contributes to the growing literature on evidence-based adaptive governance. Unlike conventional planning approaches that rely primarily on historical staffing ratios, this framework combines empirical analysis with strategic foresight to support future-oriented policy design. As argued by Wilkinson and Kupers (2022), scenario planning enables policymakers to navigate uncertainty by exploring alternative futures rather than relying on linear projections. In the context of teacher distribution, this approach offers a more flexible mechanism for responding to demographic changes, institutional diversity, and regional disparities.

Overall, the findings suggest that improving teacher distribution in madrasahs requires a shift from administrative allocation toward adaptive workforce governance. Effective distribution policies should strengthen organizational planning capacity, support teacher professional development, and incorporate regional contextual information into decision-making processes. Such an approach is more likely to promote equitable access to qualified teachers and contribute to sustainable improvements in educational quality across diverse regional contexts.

CONCLUSION

This study demonstrates that the effectiveness of madrasah teacher distribution is shaped by the interaction of organizational, individual, and external environmental factors, with organizational capacity emerging as the central mechanism through which equitable distribution can be achieved. These findings suggest that teacher distribution should not be viewed solely as a technical allocation issue based on teacher–student ratios, but rather as a multidimensional governance challenge requiring coordinated planning, institutional adaptability, and contextual responsiveness.

The study contributes to the teacher workforce and educational policy literature by advancing a systemic perspective on teacher distribution. Unlike conventional approaches that focus primarily on quantitative staffing indicators, this research integrates empirical modeling and strategic foresight to explain how organizational structures, human resource dynamics, and environmental conditions collectively influence distribution outcomes. The combination of Structural Equation Modeling (SEM) and the TAIDA scenario planning framework provides a novel analytical approach that links evidence-based diagnosis with adaptive policy design.

From a policy perspective, the findings highlight the importance of strengthening organizational planning systems, enhancing competency-based deployment mechanisms, and incorporating regional contextual data into decision-making processes. Adaptive planning frameworks are particularly relevant in diverse educational environments such as Greater Jakarta, where demographic, institutional, and socioeconomic conditions vary considerably across regions. Consequently, teacher distribution policies should move beyond uniform national allocation models toward more flexible and regionally responsive strategies.

This study also offers implications for future research on adaptive educational governance. Further studies may examine the application of scenario-based workforce planning in other educational contexts, compare regional distribution models across provinces, or incorporate longitudinal data to assess the long-term effectiveness of adaptive distribution policies. Such research would contribute to a deeper understanding of how educational systems can develop resilient and equitable workforce strategies in increasingly complex and dynamic policy environments.

Important Findings from the Research

Contribution to Theory, expands research on teacher distribution from ratio-based allocation methods to a systemic governance viewpoint, illustrates how organizational, personal, and environmental factors all have an impact on the success of distribution., and presents a methodology for adaptive educational policy analysis that integrates SEM and TAIDA.

Methodological Input, integrates scenario planning and empirical causal modeling to connect the strategic and explanatory aspects of policy research and offers a repeatable method for examining educational workforce issues in unpredictable situations. Useful Contribution, provides the Ministry of Religious Affairs, local education authorities, and madrasah leaders with evidence-based recommendations for creating flexible teacher distribution plans and encouraging the creation of regionally sensitive planning tools that advance educational quality and equity.

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