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CFA in SEM by LISREL-Assisted to Test The Construct Validity of The Performance of The Sanrobone Elementary School Principal in South Sulawesi Province

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Abstract

This study aims to test the validity of the construct of the performance of elementary school principals in South Sulawesi Province using CFA in SEM on the LISREL application based on the components of leadership, management, and personality. This type of research is ex-post facto. The number of samples collected through stratified purposive random sampling was 100 respondents with details of 15 principals, 75 class teachers, 5 religious-teachers, and 5 sports teachers in elementary schools in Sanrobone. The data collection technique used a principal performance questionnaire with 4 indicators of leadership, 4 indicators of management, and 7 indicators of personality, as well as documentation of the principal's performance. The research data were analyzed using descriptive statistical from CFA data. The results showed that the construct validity tested using CFA on the principal's performance in the leadership, management, and personality components showed goodness of fit based on the results of the goodness of fit index with the measurement model on the Absolute/Predictive fit Index criteria, namely on RMSEA 0.0057 from the limit value ≤ 0.08; RMR 0.069 from the limit value ≤ 0.1, on the Comparative Index criteria, namely on IFI and CFI each 0.92 from the limit value> 0.90, although on the Parsimony fit Index criteria, namely PNFI and PGFI each below the limit value> 0.90 but not significant. The conclusion of each indicator item contribution also shows that it is greater than the selected standardized solution value, which is greater than 0.3, so it is strong enough to explain the latent variable (principal performance).

Keywords: *CFA, construct validity, LISREL, principal's performance, SEM.*

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1. Introduction

SEM (structural equation modeling) is a model known by various terms, including covariance analysis, latent variable analysis, confirmatory analysis, and LISREL analysis (one of the names of the software). Structured equation modeling was first developed by Karl Joreskorg, Keesling and Willey (Joreskog, Karl.G.& D.Sorbom, 1993). Structured equation modeling is one part of the multivariate statistical data processing technique. Structured equation modeling is usually used to analyze variables that are used as indicators of questions in research in the field of social sciences. Most indicators used to measure variables in social research are variables that cannot be measured (latent variables). To be able to measure variables that cannot be measured (latent variables), various indicators are needed to be able to measure these variables and of course these indicators are in the form

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of variables that can be measured (manifest variables). Here, one way to overcome this is by using structural equation modeling (SEM), because it can be said that structured equation modeling is a combination of factor analysis and multiple regression analysis (more than two variables are used in the study).

Structural equation modeling (SEM) is usually used to analyze variables that are used as indicators of questions, so reliability is very necessary in this analysis. Indicator reliability refers to the accuracy and precision of the measurement instrument or indicator used in measuring a variable. The value of reliability can change because there are various factors that can affect the value of the reliability, one of which is the inconsistency of respondents in choosing questions and the inhomogeneity of the sample used. In structured equation modeling, there are two stages of approach that must be taken, the first stage is to conduct a confirmatory factor analysis (CFA) which aims to measure the validity and reliability of each indicator that is a measurement variable (manifest variable) for each variable that cannot be measured directly (latent variable) and the second stage is to conduct structural equation modeling itself (structural equation modeling, SEM) (Daengneam, Deebhijarn, & Saengnoree, 2023). In this article, what will be discussed further is related to the Confirmatory analysis factor (CFA) on the performance of the principal in terms of leadership, management, and personality components. In confirmatory factor analysis (CFA) to measure validity, there are two methods that can be used, the first is by using the variance extract approach which is used to estimate the amount of variance in a particular factor that is related to the amount of variance caused by measurement error. And the second is with convergent validity shown when different instruments are used to measure the same latent factor. It can be seen from the results of the t-value test or estimates or standardized solution output results of Lisrel for each factor load (Effiyanti, Sukirno, Widihastuti, & Retnawati, 2023).

Instruments in a study usually involve many items. Understanding data like this usually uses factor analysis. Factor analysis is used to reduce data, by finding relationships between independent variables (Stapleton, 1997), which are then collected in fewer variables to determine the latent dimension structure (Anonymous, 2001; Garson, 2006) called factors. This factor is a new variable called a latent variable or construct variable that has properties that cannot be known directly (unobservable). Factor analysis can be done in two ways, namely exploratory factor analysis and confirmatory factor analysis. Exploratory factor analysis is a technique for detecting and assessing latent sources of variation or covariation in a measurement (Joreskog & Sorbom, 1993) in this case the principal's performance. Exploratory factor analysis is an exploration of empirical data to find and detect characteristics and relationships between variables without determining a model in the data. In this analysis, the researcher does not have an a priori theory to formulate a hypothesis (Stapleton, 1997). Given its exploratory nature, the results of this exploratory factor analysis are weak. The results of the analysis that explain the relationship between variables alone are also not based on existing theories. The results of the analysis also depend only on empirical data, and if there are many observed variables, the results of the analysis will be difficult to interpret (Stapleton, 1997; Rafiuddin, 2022). Usually factor analysis is closely related to questions about validity (Nunally, 1978). When identified factors are linked, exploratory factor analysis answers questions about construct validity, whether a score measures what it should measure such as leadership, management, and principal personality to measure the principal's performance from these components.

The progress of the educational unit is primarily determined by the principal. The principal is an additional task for a teacher in organizing and managing, as well as a policy maker in the educational unit. Teachers are professional educators with the main task of educating, teaching, guiding, directing, training, assessing, and evaluating students in early childhood education through formal education, basic education, and secondary education (Law No. 14 of 2005 Article 1 (1a) concerning teachers and lecturers). Teachers have the task of being facilitators so that students can learn and develop their basic potential and abilities optimally, through school education, both those established by the government and by the community or private sector (Suparlan, 2006). Performance is an activity carried out to

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carry out, complete tasks and responsibilities in accordance with the expectations and goals that have been set (Supardi, 2016), a result of a certain activity carried out by a person in a certain period to carry out the tasks entrusted to him based on skills, experience, and sincerity (Palisungan, 2011; Sedarmayanti 2011). Principal performance is interpreted in various senses, namely: Something achieved, Achievements shown, and Work Ability (KBBI), as well as the overall intensity of the teacher's ability and success in carrying out their professional duties (Halim and Anas, 2018). The variables that shape the occurrence of principal performance in this discussion are leadership, management, and personality (Hadi, 2008).

There are several things that are the main components in measuring the performance of the principal that can be observed, including the components of leadership, management, and personality. Leadership is a process in which individuals influence groups to achieve common goals and the ability to instill confidence and gain support from members of the organization to achieve the goals of the organization (Nurthhouse, 2003 & Dubrin, 2001), and leadership is in the leader who is different between the characteristics of the leader and the characteristics of the manager (Kusuma, 2013:18). Indicators of a principal who has good performance if his leadership shows behavior that reflects the right way of Decision Making, Openness/Democracy towards members, Superior Subordinate Relationship Patterns, and Development of a Learning Community (Hadi, 2008). In management According to George R. Terry (2006) it is said that management is the scope of all activities carried out by a group of individuals to contribute their best efforts through previously determined actions to achieve common goals. In addition, management is also seen as a process that uses scientific and artistic methods to apply the functions of planning, organizing, directing, and controlling the activities of a group of people equipped with resources/production factors to achieve predetermined goals effectively and efficiently (Nursam, 2017). The indicators of management by Hadi (2008) include Learning Management, Human Resources Management, Facilities Management, and Financial Management. The last component is personality. Personality is defined as a physical and psychological system that includes visible behavior and invisible thoughts, and is not just something, but doing actions/something (Feist & Gregory, 2013). The indicators of personality are Discipline, Work Ethic, Cooperation, Initiative, Responsibility, Honesty, and Achievement Motivation (Hadi, 2008). These three components will be the observation variables to test the latent constructs in this study related to the performance of the principal.

2. **Method**

The research method used in this study is descriptive statistical research method and CFA (Confirmatory Factor Analysis), with data collection techniques in the form of a principal performance questionnaire seen from the components that form the construct, namely leadership, management, and personality and documentation of the principal's performance. Data sources were obtained from questionnaire responses consisting of 15 achievement indicators, 4 indicators for the leadership component, 4 indicators for the management component, and 7 indicators for the personality component, as well as various theoretical references and research results related to the concept of the research study. The data analysis carried out was: (1) investigating data, (2) presenting data, and (3) drawing conclusions and verifying data (Miles and Huberman, 1992) through SPSS/excel then processed in the Lisrel application to determine the suitability of the principal performance measurement model with the goodness of fit index. The reason for choosing this research method and model is to describe more specifically, transparently, and in depth the object that is the focus of the observation variables (leadership, management, and personality) in describing its latent variables (principal performance).

This research was conducted in Sanrobone District, Takalar Regency in 15 elementary schools in the 2022/2023 Academic Year, Gazal Semester. The instrument used was a questionnaire that had been tested for construct, content, and external validity. The validity testing of the questionnaire was carried out by operationally defining the concept to be measured, conducting a questionnaire trial on 30 respondents (approaching the normal

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curve), preparing a tabulation table of answers, and calculating the correlation between each item in the questionnaire with the total score using the product moment correlation technique. The validity of the questionnaire showed that the calculated "r" was greater than the critical "r" so that it was declared valid.

3. Results and Discussion

Preparation and development stage

The first step taken is to Determine the Objective, Focus, Measurement Model, RMT Model characterized, CFA Process, and steps n Construct based on Theory and Variable Indicators. The objective is carried out to Test the measurement model whose formulation comes from theory. then after determining the objective, the focus is carried out. The focus is carried out to find out (1) Are the indicators conceptualized unidimensional, precisely, and consistently? and (2) What indicators are dominant in forming the construct being studied? then it is to carry out the Measurement Model. The measurement model used refers to RMT (Reflective Measurement Theory) which holds that based on an understanding of the construct derived from the theory can be identified. The measurable indicators as a reflection/manifest of the construct. The reflective indicator model assumes that the variation in the construct measurement score is a function of the true score plus error (principal factor model) where the covariance of the indicator measurement is influenced by the latent construct or reflects the variation of the latent construct (Ghozali, 2008).

The opposite of the reflective indicator model is known as formative. Next, the RMT model is characterized as follows: (1) Changes in the latent construct will influence changes in the indicators; (2) Direction of causality from construct to indicator (arrow from construct to indicator); (3) The indicator sizes are expected to be correlated with each other (measures must have internal consistency reliability); (4) Removing indicators from the model will not change the meaning of the construct; (5) Calculating the presence of measurement errors (errors) at the indicator level; and (6) The score scale does not describe the construct (Bollen and Lennox, 1991). the next step is the CFA Process. In principle, CFA refers to the RMT model, so the steps taken are: (1) Examining the theory about the construct to be measured; (2) From theory, theoretical and constitutive definitions (theoretical definitions) of the construct to be measured are obtained; and (3) Identify dimensions/indicators/measurable items/items as reflections/manifests of the construct.

Next Steps to Determine the Construct: Theory: The principal is an additional task for a teacher in organizing and managing, as well as a policy maker in an educational unit. Teachers are professional educators with the main task of educating, teaching, guiding, directing, training, assessing and evaluating students in early childhood education through formal education, basic education and secondary education (Constitution, 1a, No. 14, 2005 about teachers and lecturers). Teachers have the task of being facilitators so that students can learn and develop their basic potential and abilities optimally, through school education, whether established by the government or by the community or private sector (Suparlan, 2006). Performance is an activity carried out to carry out, complete tasks and responsibilities in accordance with predetermined expectations and goals (Supardi, 2016), a result of the achievement of a certain activity carried out by a person within a certain period to carry out the tasks entrusted to him on the basis of skills, experience and sincerity (Palisungan, 2011; Sedarmayanti 2011). The performance of a school principal is defined in various terms, namely: Something achieved, Achievement demonstrated, and Work Ability (KBBI), as well as the overall intensity of the teacher's ability and success in carrying out his professional duties (Halim and Anas, 2018). The variables that shape the performance of school principals in this discussion are leadership, management and personality (Hadi, 2008). and Determine variable indicators (as in the following figure):

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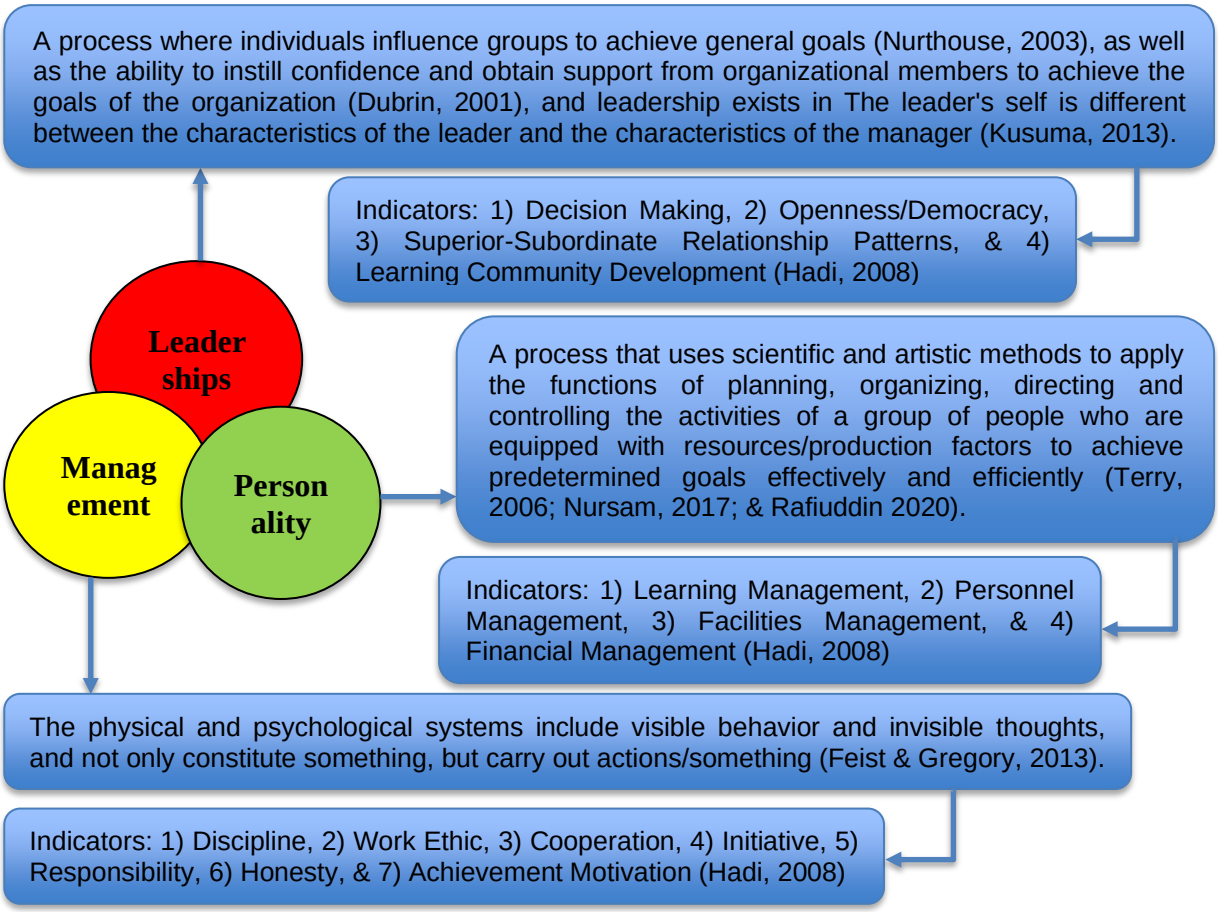

Figure 1. Determining indicator variables
Source: Research Data

Data collection, analysis and interpretation stages

The second stage is collecting respondent data. The lens of respondents' data collection activities related to the component indicators forming latent variables which are the observed variables, namely leadership, management and personality obtained from respondents from school principals, class teachers, religion teachers and sports teachers, can be seen in the following picture:

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Figure 2. Activity lens
Source: Research Data

The data results from 100 respondents can be seen as follows:

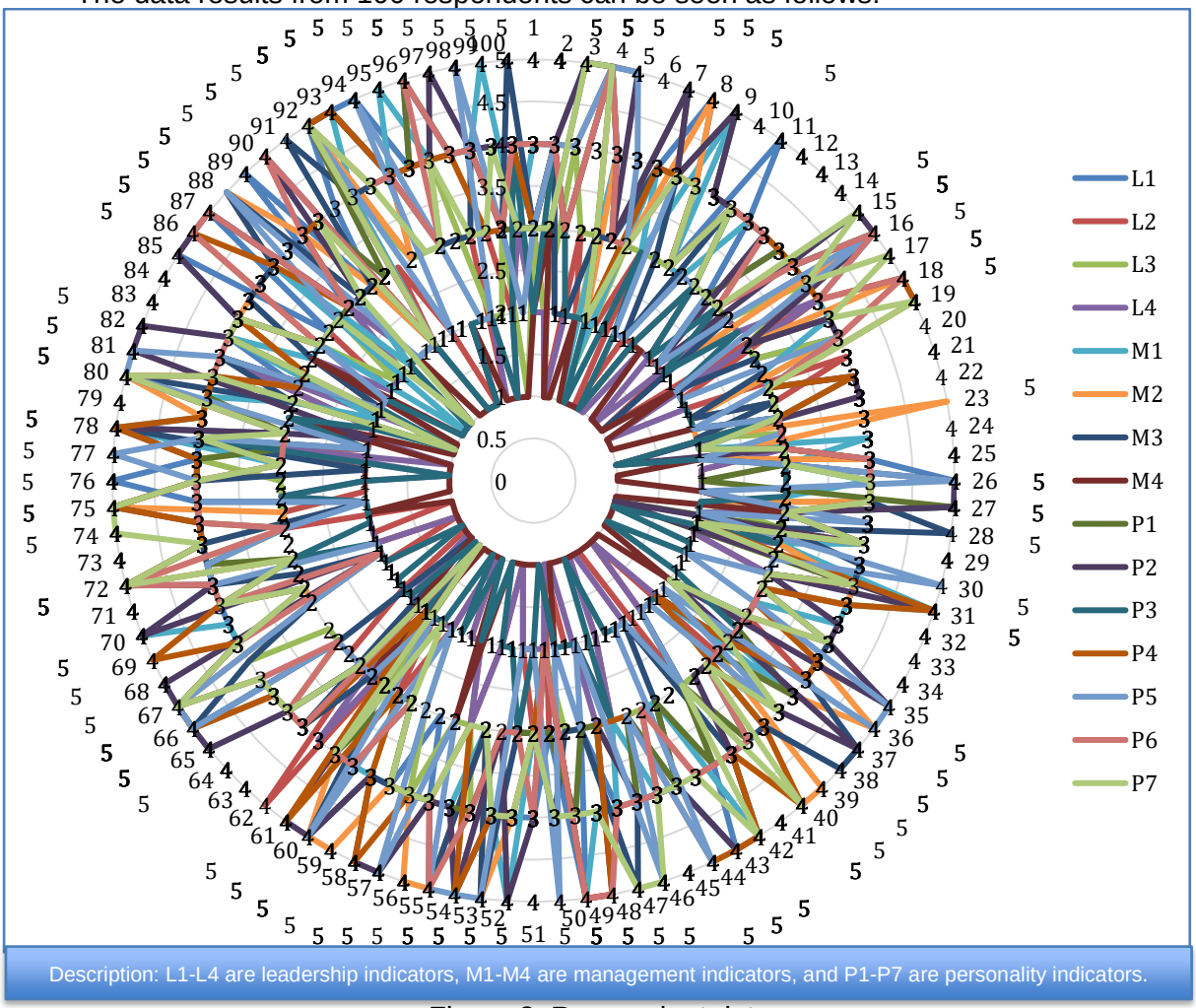

Figure 3. Respondent data
Source: Research Data

Based on the results of the data normality test using Lisrel, the average data shows normal. More details can be seen in the following table:

Table 1. Test of univariate normality for continuous variables from LISREL

	skewness	kurtosis	Skewness & kurtosis
Variable	Z-Score & P-Value	Z-Score & P-Value	Chi-Sguare & P-Value
L1	-1.834 0.067	1.597 0.110	5.916 0.052
L2	1.291 0.197	0.496 0.620	1.913 0.384
L3	-0.142 0.887	-1.544 0.123	2.405 0.300
L4	1.668 0.095	-0.657 0.511	3.213 0.201
M1	-1.448 0.148	-0.219 0.827	2.144 0.342
M2	-1.776 0.076	-1.385 0.166	5.070 0.079
M3	-1.162 0.245	-0.526 0.599	1.627 0.443

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M4	-1.406	0.160	-0.159	0.874	2.003	0.367
P1	-0.923	0.356	-0.458	0.647	1.063	0.588
P2	-0.446	0.656	-1.306	0.192	1.904	0.386
P3	1.890	0.059	0.858	0.391	4.310	0.116
P4	-1.469	0.142	-0.816	0.415	2.824	0.244
P5	2.383	0.017	-0.189	0.850	5.714	0.057
P6	-1.710	0.087	1.172	0.241	4.298	0.117
P7	-1.717	0.086	0.853	0.394	3.676	0.159

Relative Multivariate Kurtosis = 1.050

Value	Z-Score	P-Value	Value	Z-Score	P-Value	Chi-Square	P-Value
1.356	1.118	0.264	24.844	1.008	0.313	2.265	0.322

Source: Processing Data

Based on the results of the data normality test using the LISREL application, it shows that all indicators have a normal distribution where the P-Value is > 0.05. If the data as a whole or on average shows normal, then the next step can be to search for Goodness of Fit Statistics to find out whether the average criteria are met and whether the model fits this measurement. Data normality testing other than LISREL can be carried out in AMOS, Mplus, R (lavaan), and SPSS applications by determining skewness and kurtosis divided by standard error with a result value of ±1.96. The Goodness of Fit (GoF) statistical results can be seen in the following table:

Table 2. Goodness of Fit Statistics

Goodness of Fit Statistics
Degrees of Freedom = 87
Minimum Fit Function Chi-Square = 156.83 (P = 0.00)
Normal Theory Weighted Least Squares Chi-Square = 153.53 (P = 0.00)
Estimated Non-centrality Parameter (NCP) = 66.53
90 Percent Confidence Interval for NCP = (35.89; 105.03)
Minimum Fit Function Value = 1.58
Population Discrepancy Function Value (F0) = 0.67
90 Percent Confidence Interval for F0 = (0.36; 1.06)
Root Mean Square Error of Approximation (RMSEA) = 0.088
90 Percent Confidence Interval for RMSEA = (0.065; 0.11)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.0057
Expected Cross-Validation Index (ECVI) = 2.22
90 Percent Confidence Interval for ECVI = (1.91; 2.61)
ECVI for Saturated Model = 2.42
ECVI for Independence Model = 10.06
Chi-Square for Independence Model with 105 Degrees of Freedom = 965.87
Independence AIC = 995.87
Model AIC = 219.53
Saturated AIC = 240.00
Independence CAIC = 1049.94
Model CAIC = 338.50
Saturated CAIC = 672.62
Normed Fit Index (NFI) = 0.84
Non-Normed Fit Index (NNFI) = 0.90
Parsimony Normed Fit Index (PNFI) = 0.69
Comparative Fit Index (CFI) = 0.92
Incremental Fit Index (IFI) = 0.92
Relative Fit Index (RFI) = 0.80

Critical N (CN) = 77.13

Root Mean Square Residual (RMR) = 0.069
Standardized RMR = 0.083
Goodness of Fit Index (GFI) = 0.83
Adjusted Goodness of Fit Index (AGFI) = 0.76
Parsimony Goodness of Fit Index (PGFI) = 0.60
Time used: 0.047 Seconds

Source: Processing Data

Based on the Goodness of Fit Statistics (GoF) output results, it shows that the average criteria are met, namely Chi-Square (χ^2): Probability value ≥ 0.05; Degree of Freedom (df): Value of χ^2/df ≤ 3; Goodness of Fit Index (GFI): Value ≥ 0.9; Adjusted Goodness of Fit Index (AGFI): Value ≥ 0.8; Comparative Fit Index (CFI): Value ≥ 0.9; Root Mean Square Error of Approximation (RMSEA): Value ≤ 0.08; and Standardized Root Mean Square Residual (SRMR): Value ≤ 0.05 so that this model is declared to have a good fit in this measurement. Based on the measurement results related to the image of the results of testing the school principal's performance construct, it can be seen in the following image:

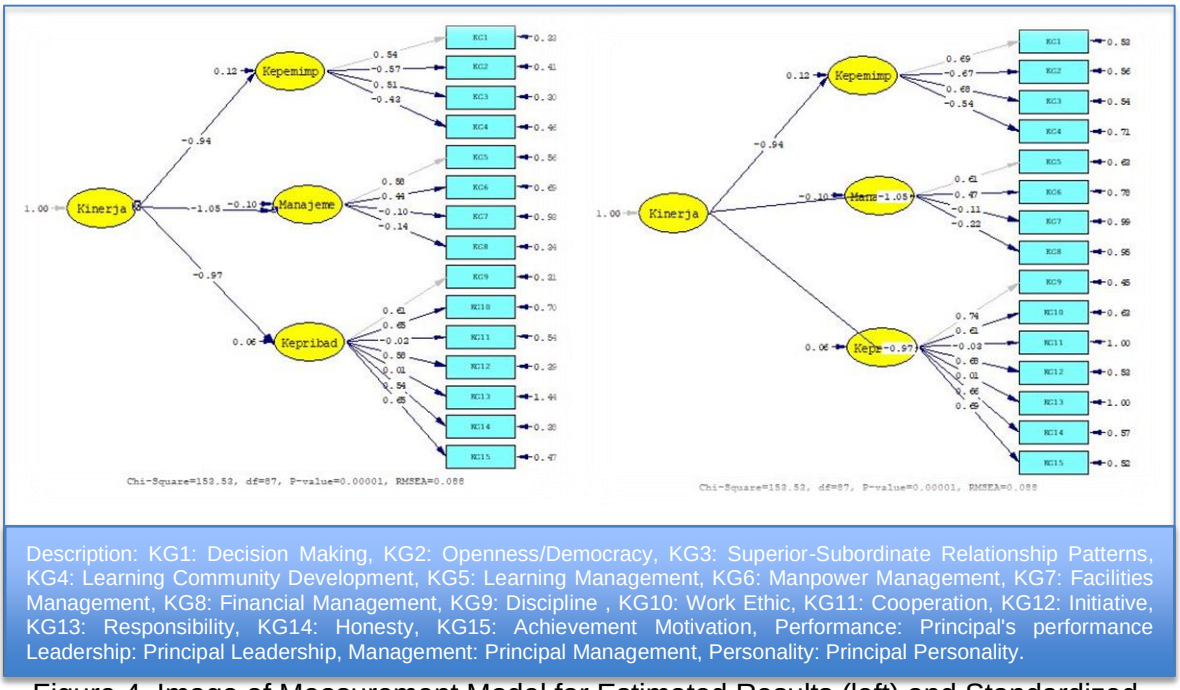

Figure 4. Image of Measurement Model for Estimated Results (left) and Standardized Solution results (right)
Source: Research Data

The loading value of each item or variable on the construct shows the size of the contribution to the item or variable. The greater the loading value, the stronger the contribution made to the variable or construct. Conversely, the smaller the loading value of each item/factor or the negative, it indicates that the contribution given is weak or even non-existent. In the standardized solution, if the items contributed are at 0.3 or 0.5 then these items are very strong in explaining the latent variable (principal performance variable). Vice versa, if it is below this value then the items are not strong enough to explain the latent variable.

The next step is to determine the suitability of the Goodness of Fit (GoF) Index Model with the Measurement Model. The final stage in reading the results of this test is to determine the suitability of the Goodness of Fit (GoF) Index Model with the Measurement Model used,

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namely Reflective Measurement Theory (RMT). Based on the results of the analysis, the following data was obtained:

Table 3. Suitability of the Goodness of Fit Index Model with the Measurement Model

Criteria	Value limit/cut off	Performance data results
Absolute/Predictive fit Index		
Chi square, probability signifikan (p-value)	≥ 0.05	0.00001
Ratio of chi square/DF	< 2 or 3	0.00
RMR (Root mean square residual)	≤ 0.1	0.069
SRMR (Standardized root mean square residual)	≤ 0.08	0.083
RMSEA (Root mean square error of approximation)	≤ 0.08	0.0057
GFI (Goodness of fit index)	> 0.90	0.83
AGFI (Adjusted GFI)	> 0.90	0.76
Comparative Index		
NFI (Normed fit index)	> 0.90	0.84
IFI (Incremental fit index)	> 0.90	0.92
CFI (Compatative fit index)	> 0.90	0.92
Parsimonius fit Index		
PNFI (Parsimony adjusted NFI)	> 0.90	0.69
PGFI (Parsimony adjusted GFI)	> 0.90	0.60
AIC (Akaike information criterian)	expected to be small	

Source: Processing Data

Based on the results of the Goodness of Fit Index (GoFI) Model Fit Test with the Construct/Latent Performance Measurement Model of School Principals, the data obtained is very suitable because most of the criteria fulfill these requirements, namely the fulfillment of the Absolute/predictive fit Index at a Ratio of chi square/DF value < 2 or 3 with an achievement of 0.00; RMR (Root mean square residual) ≤ 0.1 with an achievement of 0.069; SRMR (Standardized root mean square residual) ≤ 0.08 with an achievement of 0.083; and RMSEA (Root mean square error of approximation) ≤ 0.08 with an achievement of 0.0057. Meanwhile, in the Comparative Index, the NFI (Normed fit index) and CFI (Compatative fit index) values are each at 0.92, which means > 0.90 of the limit-value. Based on the results of this measurement, it can be concluded that all indicators used to determine the performance of elementary school principals in Sanrobone, South Sulawesi Province from the leadership, management and personality components can be used because the average match between the GoFI model and the measurement model is met. This can apply to testing the performance of a leader if you want to apply it to other schools/institutions.

4. **Conclusions**

Overall, the components of leadership, management and personality can be used as instruments in measuring the performance of school principals with accompanying indicators. Apart from that, it is important to know that CFA and EFA are different things so that in determining the components that form the construct of school principal performance, it is truly understood. The difference between CFA (Confirmatory Factor Analysis) and EFA (Exploratory Factor Analysis) is that CFA is a method used to build a structural model consisting of a set or many variables (testing dimensions/constructs) while EFA is a factor analysis method for identifying relationships between indicator variables. in building constructs (searching/exporting). There are 2 variables in CFA, namely latent variables (invisible/variables that cannot be observed directly from the data), in this case the performance of the school principal, and observation variables (observations) through indicators and items, in this case, leadership, management, and personality along with the details. The results of the Goodness of Fit Index Model show that it is FIT because it shows that all the criteria for the Goodness of Fit Index Model are met. In the CFA, the principal's performance is not influenced by leadership, management and personality, but this variable is a component/aspect that discusses the latent construct in the principal's performance (reflective) because in the CFA, it is not aimed at looking for factors that influence the principal's performance, such as salary. high level, certification, facilities, etc., but testing models from existing theories (looking for theories/proving existing theories). Furthermore,

CFA (Confirmatory Factor Analysis), SEM (Structural Equation Modeling), and LISREL (Linear Structural Relations) are statistical analysis techniques that are closely related to data analysis which have similarities, namely analyzing the relationship between variables, explaining data using modeling techniques, and able to handle complex data. However, the three have differences, namely in terms of 1) Objective: CFA: Testing the validity and reliability of measurement instruments by ensuring that the indicators used are in accordance with the concept being measured; SEM: Analyzing relationships between interrelated variables and modeling the structure of these relationships; and LISREL: Is software for analyzing structural models and can also be used for CFA and SEM; 2) Focus: CFA: Focus on measurement and construct validation; SEM: Focus on relationships between variables; and LISREL: Focus on structural model analysis; 3) Model: CFA: Using confirmatory factor model; SEM: Uses more complex structural models; LISREL: Uses flexible structural models; 4) Analysis: CFA: Analyzing the covariance between indicators and factors; SEM: Analyze the relationship between variables; and LISREL: Analyze structural models considering covariance and correlation; 5) Software: CFA: Can be run with software such as Mplus, R (lavaan), or SPSS; SEM: Can be run with software such as Mplus, R (lavaan), SPSS, or Amos; and LISREL: This is special software for structural model analysis; and 6) Application: CFA: Suitable for development and validation of measurement instruments; SEM: Suitable for analyzing complex relationships between variables; and LISREL: Suitable for analyzing complex structural models.

In this study, the sample used was sub-district scale. Future researchers are advised to test other constructs related to the performance of school principals and teachers with components that have not been discussed in this article on a larger scale as well as the performance of regional heads and heads of other agencies or institutions. Furthermore, to measure the performance of school principals from three components, namely leadership, management and personality, you can use the identifier in this research as an instrument because it has been tested/proven that the instrument is suitable for the latent variable, namely the performance of the principal.

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