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Confirmatory Factor Analysis for Headmaster Leadership Style, Teacher Management Motivation and Standard1 Assessment MEQSw2 Management of Terengganu National Schools

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Abstract: There are two ways to conduct Confirmatory Factor Analysis (CFA) using individual confirmatory factor analysis or group confirmatory factor analysis based on the measurement model. The number of items depends on the construct used in the study and the measurement model analysis is conducted separately if the number of items in the construct is more than four. Whereas, pooled CFA runs all measurement models at the same time. Items with a factor loading value of less than 0.6 are considered unimportant to the measurement of the construct and can be discarded Chik, Abdullah, Ismail and Mohd Noor (2024). A total of 384 study samples were involved in this research. Data were analyzed using the IBM-SPSS-AMOS (Structural Equation Modeling-SEM) program version 21.0. Adjustment tests were conducted to ensure that the tested indicators truly represent the construct being measured and Confirmatory Factor Analysis was conducted in this study as a prerequisite that must be met. The findings of the study show that all the correlations between the constructs Headmaster Leadership Style (based on Transformational Leadership, Transactional Leadership, Laisez_Faire Leadership), Teacher Management Motivation and Malaysian Education Quality Standards (MEQS) Wave 2 (MEQSw2) have a value less than 0.85 (<0.85) teachers Management of Terengganu National Schools. The results of the combined confirmatory factor analysis of all measurement models (Pooled CFA), prove that all constructs do not have a strong relationship with each other to avoid the existence of multicollinearity problems.

Keywords: Headmaster Leadership Style, Teacher Management Motivation, Standard1 Assessment MEQSw2, Confirmatory Factor Analysis (CFA), Pooled CFA

Introduction

The National Education Goal is a strong vision towards achieving the national education vision based on our country's National Education Philosophy. It plays an important role in efforts to produce first-Class human capital which will then be able to increase the economy of the people with high incomes by 2020 (Yahya Don, 2012). Education requires a process of change that can develop the country and

its children in the future. Effective and quality education will help produce a new generation who understand the meaning of life and responsibility. Such new young people will strive to develop their talents and potential towards building a better life, whether through themselves, family, race, religion, or country (Yahya Don, 2012; Najeemah Mohd Yusof, 2012). Therefore, education is the main tool of the country that functions as a medium and channel to meet the needs of the country in various aspects, especially in preparation for the formation of new leaders of the country. To respond to the direction of the National Education Vision, education leadership needs to mobilize efforts to ensure that it can be realized and in line with the National Education Philosophy which is the backbone of education in all implementations. The entire education management and leadership needs to be aware of the education vision outlined to increase high productivity (Yahya Don, 2012).

The effectiveness of leadership in making national education a success is closely related to various positive qualities which require internal strength in facing any obstacles and challenges and daring to take risks through the creative, innovative and imaginative power of a leader (Yahya Don, 2012). Teachers are the backbone of the education system, and their level of motivation directly affects the level of education quality. This is because teacher motivation has an influence on the success of the school, namely being able to inspire students and create a positive learning atmosphere in the school. When teachers are motivated, they bring enthusiasm, creativity, and a positive attitude to the teaching and facilitation process which can create an interesting and effective learning environment.

Therefore, the influence of the leadership style of the principal must be able to instill optimal motivation among teachers in the school. This is because the leadership style of the principal is able to influence teacher motivation and the success of an organization by ensuring that the obligations and responsibilities to the institution are fulfilled with great commitment and responsibility in all activities at the school (Murgaya & A. Hamid, 2020). The leadership style of school leaders has a major influence on how teachers and students in schools inspire themselves to evaluate and make the best decisions and complete tasks with dedication. Leadership style has also increased teachers' motivation to teach and commitment to their careers by enabling them to use various leadership techniques and strategies to influence and motivate colleagues and students to advance learning and realize the goals of the National Education Philosophy, which is the creation of individuals who are physically, emotionally, spiritually, and intellectually balanced (Hossen, 2023).

MEQSw2 is a redrafting of the Malaysian Education Quality Standards (MEQS) 2010 with several improvements resulting from a series of studies and improvement actions. This effort is to ensure the role of the headmaster as a high-impact leader who is able to mobilize and mobilize school staff in an integrated manner to develop the school and improve the quality of teaching and learning. In ensuring the success and effectiveness of each plan that has been arranged, the headmaster needs support and cooperation from his subordinates to implement and make each plan that has been arranged a success. In this case, teachers are the implementers of all these agendas. Therefore, the Headmaster's leadership style is important in building good relationships with all teachers and school staff as coordinators, controllers, planners and implementers (Ofojebe & Ezugoh, 2010). This is also in line with the opinion of Azizi, Halimah, Noordin and Lim (2011) in the Report of the Meeting of the Excellent Principals Movement in 1998 which stated that effective school leaders need to have excellent communication skills, build good relationships with those around them, accept responsibility professionally, make decisions based on mutual agreement and several other personal skills. The purpose of this research is to identify the influence of Headmaster Leadership Style (based on

Transformational Leadership, Transactional Leadership, Laisez_Faire Leadership) and Teacher Management Motivation on Standard1 Assessment MEQSw2 Management of Terengganu National Schools (Rahman, Ismail, et al., 2025).

Research Methodology

The research method used is quantitative and uses research instruments that have been adapted according to the suitability of factors Headmaster Leadership Style (based on Transformational Leadership, Transactional Leadership, Laisez_Faire Leadership), Teacher Management Motivation and Standard1 Assessment MEQSw2 Management of Terengganu National Schools. Data were analyzed using Structural Equation Modeling (SEM) with the help of the IBM-SPSS-AMOS version 21.0 program. SEM is formed with two (2) main models namely Measurement Model and Structural Model. Before the SEM test is performed, an adaptation test should be conducted to ensure that the indicators tested truly represent the construct being measured. Confirmatory Factor Analysis (CFA) is a measurement model test to ensure that each construct meets procedures such as validity and reliability for each construct tested (Kline, 2016; Hair, Black, Babin, Anderson & Tatham, 2006; Schumacker & Lomax, 2004). The fit of the measurement model is very important to ensure that each latent construct in this study has fit with the data studied before SEM can continue (Kline, 2016; Schumacker & Lomax, 2004).

Using the CFA method can assess the extent to which the observed factors are significant to the latent construct used. This evaluation is done by examining the value of the strength of the regression structure path from the factor to the observed variable (ie Factor Loading value) instead of the relationship between the factors (Byrne, 2013). Through the use of CFA, any item that does not fit the measurement model is dropped from the model. This discrepancy is due to the low value of the load factor. Researchers need to perform the CFA process on all the constructs involved in the model, either separately or in a pooled CFA model (Hossen & Mohd Pauzi, 2023). The suitability of the tested hypothesis model was verified by using Fitness Indexes to see the value of Root Mean Square Error of Approximation (RMSEA<0.08), Comparative Fit Index (CFI>0.90) and Chi Square/Degrees of Freedom (chisq/df<5.0). According to Hair et al. (2006) if the $\chi 2$ value is less than 2.00 but significant, then it is necessary to state whether the sample size is large or vice versa. A sample size that exceeds 200 can cause the $\chi 2$ value to be significant. Because of that, Hair and his colleagues suggested two other indices namely CFI and RMSEA to ensure that the CFA analysis forms the unidimensionality of the study model. If the CFI value exceeds 0.90 and the RMSEA is less than 0.08, it is said that there is unidimensionality for the formation of each construct (Hossen & Pauzi, 2025).

Findings

Confirmatory Factor Analysis (CFA)

There are two models that need to be analyzed in carrying out Structural Equation Modeling (SEM), namely the Measurement Model and the Structural Model. Chik et al. (2024) suggest two steps that need to be carried out in a Structured Equation Modeling (SEM) namely: a) Confirming the Measurement Model of all the constructs involved through the Confirmatory Factor Analysis (CFA) method, and b) Modeling all the constructs into Structural Model as well as doing SEM procedures (Chik et al., 2024; Hoque, Awang, Jusoff, Salleh & Muda, 2017; Kashif, Samsi, Awang & Mohamad., 2016). The fit of the Measurement Model with the study data is important to validate a SEM. If the Measurement Model does not match the data from the field, then the constructed SEM is invalid.

Therefore, the first step in SEM analysis is to determine the appropriateness of the Measurement Model to the data from the field. Analysis of the fit of the Measurement Model with field data is done by using Confirmatory Factor Analysis (CFA) to confirm the proposed Measurement Model of the construct. Testing the Validity and Reliability of the Measurement Model: Before evaluating the appropriateness of a constructed model, the evaluation of Unidimensionality, Validity and Reliability of the Measurement Model of the construct of this study needs to be carried out first. Unidimensionality: This requirement can be met through the items deletion procedure that has a low Factor Loading value until it reaches the set Fitness Indexes level. Items with a Factor Loading value of less than 0.6 are considered unimportant to the measurement of the construct and should be discarded. Validity: The three types of validity that must be achieved by a construct measurement model are Construct Validity, Convergent Validity and Discriminant Validity. Construct Validity: Refers to the accuracy of a measurement instrument used to measure the intended construct in the study. Construct Validity describes the extent to which a statement in the item used can measure the construct that the researcher wants to measure. Construct Validity is achieved when all Fitness Indexes for the construct in question meet the specified level (Chik et al., 2024). Table 1 below shows the three categories of fit index that need to be achieved by a construct measurement model, namely Absolute Fit, Incremental Fit and Passionate Fit (Rahman, Hossain, et al., 2025).

Table 1 *Three (3) Categories of Matching Indexes and Recognized Index Types*

Name of Category	Name of Index	Level of Acceptance
Absolute Fit Index	RMSEA	RMSEA < 0.08
Incremental Fit Index	CFI	CFI > 0.90
Parsimonious Fit Index	Chisq/df	Chi-Square/ df < 5.0

Source: Chik et al. (2024)

Convergent Validity: Refers to the relationship of a measurement model with other measurement models in theory. Convergent validity of a construct will be achieved if all Average Variance Extracted (AVE) values reach a minimum value of 0.50. Discriminant Validity: Explains the extent to which a construct does not have too strong a relationship with another construct in the same model so that it can be said that a construct is a shadow or repetition (redundant) of another construct. Discriminant Validity is assessed through the discriminant validity index summary. According to Chik et al. (2024) and Hoque et al. (2017), discriminant validity for a construct can be achieved if all diagonal matrix values are greater than other values in row cells and also in column cells. The diagonal value of the matrix is the square root of the AVE, while the values in the matrix are the correlations between the constructs in the model. Average Variance Extracted (AVE): The AVE value is calculated from the factor loading value for each item in a certain construct and needs to reach a minimum limit of 0.50 (AVE > 0.5) to prove the reliability of the Measurement Model of a latent construct in this study, which can be achieved (Chik et al., 2024; Hoque et al., 2017). Reliability: SEM uses the Composite Reliability (CR) value to verify the reliability of the Measurement Model according to the factor loading value of each item. Each construct that has a value of CR>0.6, has achieved Composite Reliability (Chik et al., 2024; Hoque et al., 2017).

CFA Analysis for the Measurement Model of Headmaster Leadership Style Based on Transformational Leadership Construct

The analysis of Fitness Indexes in Table 2 below shows that the Transformational Leadership construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik et al., 2024; Hoque et al., 2017).

Table 2 *Analysis To Determine Validity for Transformational Leadership Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.053	Reach the set level
2. Incremental fit	CFI	0.979	Reach the set level
3. Parsimonious fit	ChiSq/df	2.096	Reach the set level

The Measurement Model for the Transformational Leadership construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Rana et al., 2024)**.**

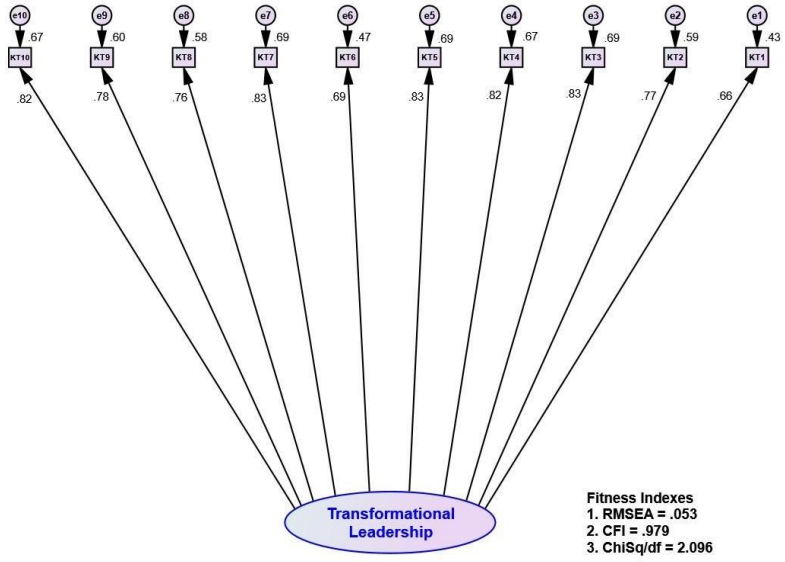

Figure 1. The Measurement Model of Transformational Leadership Construct

CFA Analysis for the Measurement Model of Headmaster Leadership Style Based on Transactional Leadership Construct

The analysis of Fitness Indexes in Table 3 below shows that the Transactional Leadership construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik et al., 2024).

Table 3 *Analysis To Determine Validity for Transactional Leadership Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.079	Reach the set level
2. Incremental fit	CFI	0.981	Reach the set level
3. Parsimonious fit	ChiSq/df	3.403	Reach the set level

The Measurement Model for the Transactional Leadership construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik et al., 2024; Kashif et al., 2016).

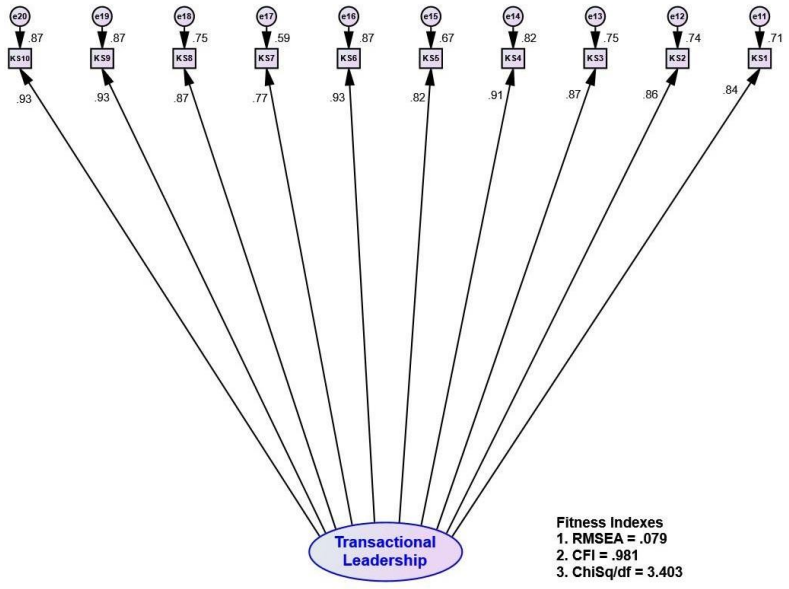

Figure 2. The Measurement Model of Transactional Leadership Construct

CFA Analysis for the Measurement Model of Headmaster Leadership Style Based on Laisez_Faire Leadership Construct

The analysis of Fitness Indexes in Table 4 below shows that the Laisez_Faire Leadership construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik et al., 2024; Hoque et al., 2017).

Table 4 *Analysis To Determine Validity for Laisez_Faire Leadership Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.048	Reach the set level
2. Incremental fit	CFI	0.988	Reach the set level
3. Parsimonious fit	ChiSq/df	1.870	Reach the set level

The Measurement Model for the Laisez_Faire Leadership construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik et al., 2024; Kashif et al., 2016).

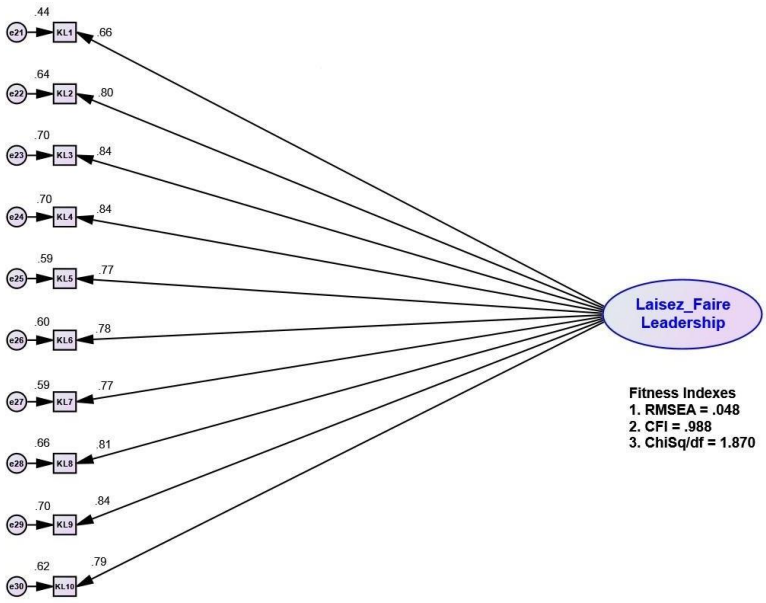

Figure 3. The Measurement Model of Laisez_Faire Leadership Construct

CFA Analysis for the Measurement Model of Teacher Management Motivation Construct

The analysis of Fitness Indexes in Table 5 below shows that the Teacher Management Motivation construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik et al., 2024; Hoque et al., 2017).

Table 5 *Analysis to Determine Validity for Teacher Management Motivation Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.053	Reach the set level
2. Incremental fit	CFI	0.982	Reach the set level
3. Parsimonious fit	ChiSq/df	2.089	Reach the set level

The Measurement Model for the Teacher Management Motivation construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik et al., 2024; Kashif et al., 2016).

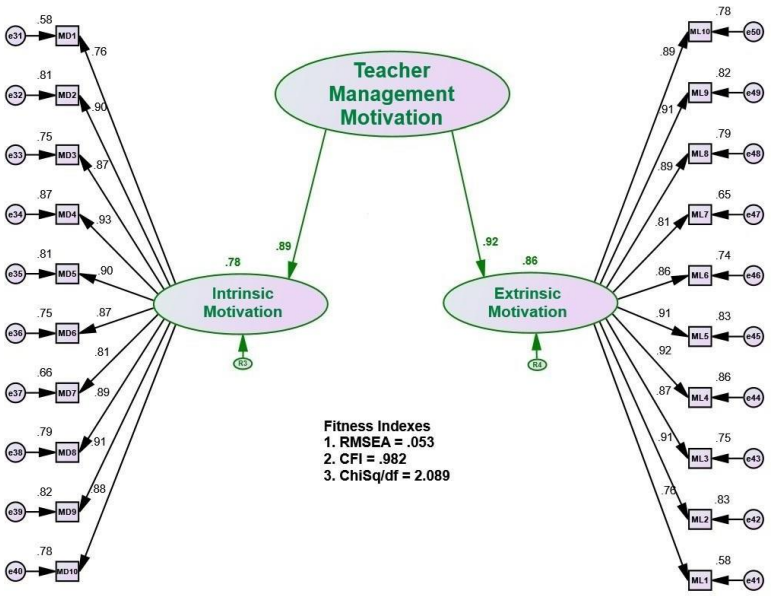

Figure 4. The Measurement Model of Teacher Management Motivation Construct

CFA Analysis for the Measurement Model of Standard1 Assessment MEQSw2 Construct

The analysis of Fitness Indexes in Table 6 below shows that the Standard1 Assessment MEQSw2 construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik et al., 2024; Hoque et al., 2017).

Table 6 *Analysis to Determine Validity for Standard1 Assessment MEQSw2 Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.077	Reach the set level
2. Incremental fit	CFI	0.987	Reach the set level
3. Parsimonious fit	ChiSq/df	3.245	Reach the set level

The Measurement Model for the Standard1 Assessment MEQSw2 construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik et al., 2024; Kashif et al., 2016).

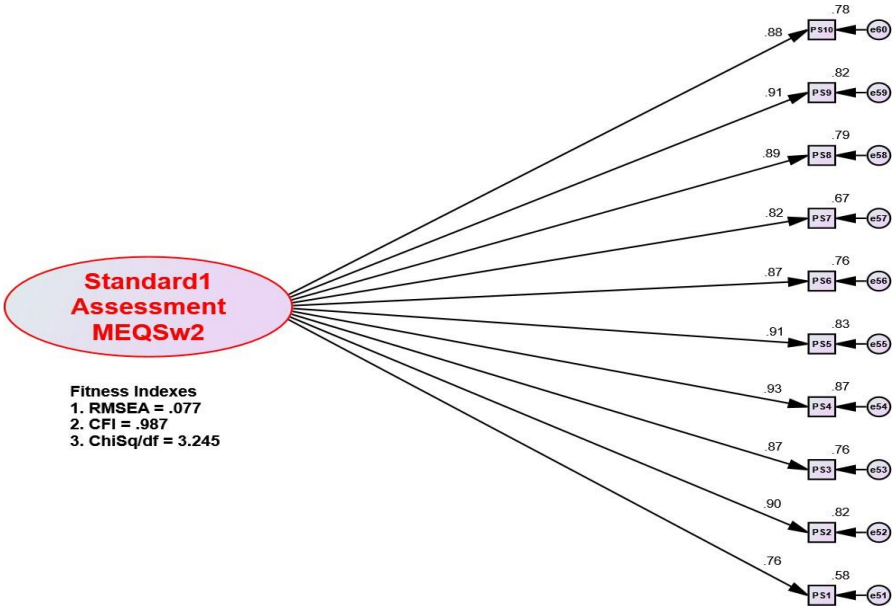

Figure 5. The Measurement Model of Standard1 Assessment MEQSw2 Construct

Combined Confirmatory Factor Analysis of All Measurement Models (Pooled CFA)

This Pooled CFA analysis is necessary to evaluate the correlation value between the constructs in the Discriminant Validity procedure. If the correlation value between two constructs exceeds 0.85, then there is redundancy between the two constructs (Chik et al., 2024; Hoque et al., 2017). A model involving a second order construct is a construct that has dimensions or sub-constructs where each dimension or sub-construct has a certain number of items. Researchers will have difficulty combining all the second-level constructs in one model to conduct Pooled Confirmatory Factor Analysis (Pooled CFA). The solution, all second order constructs need to be summarized into a first order construct model by taking the mean item of each sub-construct or dimension (Chik et al., 2024; Hoque et al., 2017). The results of the Pooled CFA procedure are shown in Figure 6 below. The single headed arrow value is the factor loading values of each item and the double headed arrow value is the correlation between constructs. Through the Pooled CFA method, only one model fit index that represents all the constructs is released. Table 7 below shows that all three categories of model fit index for the construct measurement model have been achieved (Hossen & Salleh, 2024).

Table 7 *Analysis to Determine Validity for All Constructs and Sub-Constructs*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.057	Reach the set level
2. Incremental fit	CFI	0.913	Reach the set level
3. Parsimonious fit	ChiSq/df	2.233	Reach the set level

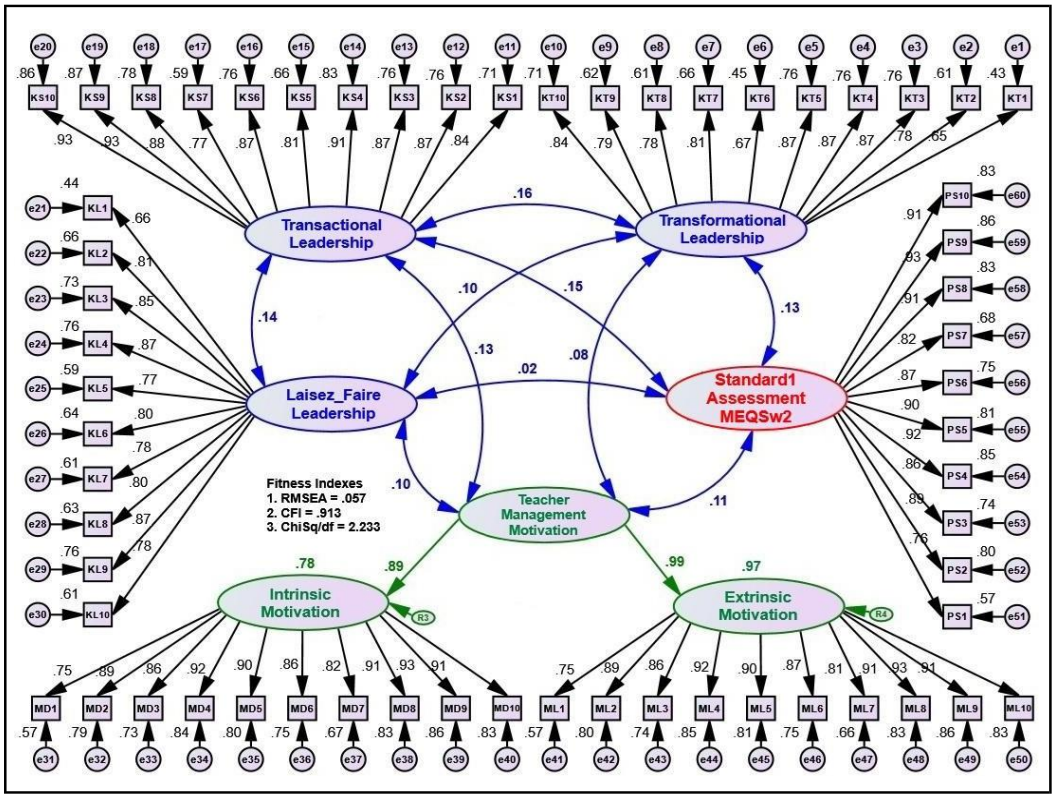

Figure 6. Pooled CFA Analysis Findings

Discriminant Validity is necessary to prove that all the constructs in the model do not have a strong relationship with each other leading to the problem of multicollinearity (Chik et al., 2024). Table 8 below shows the Discriminant Validity Index Summary between all the constructs in the model.

Table 8 *Discriminant Validity Index Summary*

Constructs	(a)	(b)	(c)	(d)	(e)
Transformational Leadership (a)	**0.913**				
Transactional Leadership (b)	0.160	**0.925**			
Laisez_Faire Leadership (c)	0.100	0.140	**0.918**		
Teacher Management Motivation (d)	0.080	0.130	0.100	**0.941**	
Standard1 Assessment MEQSw2 (e)	0.130	0.150	0.020	0.110	**0.934**

Table 8 above presents the square root value of AVE for each construct on the diagonal matrix. The other values in the table are correlations between the two constructs. According to Chik et al. (2024), Discriminant Validity will be achieved if all the values of the square root of AVE (Diagonal) are greater than other values whether the values are in rows or columns. Findings from Table 8 show that Discriminant Validity for all constructs in the model has been achieved (Hossen et al., 2023).

Conclusion

Overall, the CFA analysis conducted on the measurement model for Headmaster Leadership Style (based on Transformational Leadership, Transactional Leadership, Laisez_Faire Leadership), Teacher Management Motivation and Standard1 Assessment MEQSw2 construct, has reached the level of fitness indexes. The results of the combined confirmatory factor analysis of all measurement models (Pooled CFA), prove that all constructs do not have a strong relationship with each other to avoid the existence of multicollinearity problems.

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Data Availability: The author has all the data employed in this research and is open to sharing it upon reasonable request.

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