EDUCATION MANAGEMENT RESEARCH DATA ANALYSIS: COMPARISON OF RESULTS BETWEEN LISREL, TETRAD, GSCA, AMOS, SMARTPLS, WARPPLS, AND SPSS FOR SMALL SAMPLES

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Abstract
The purpose of this study is to compare the results of quantitative research data processing in the field of education management using Lisrel, Tetrad, GSCA, Amos, SmartPLS, WarpPLS, and SPSS software for small samples or respondents. This research method is quantitative and research data analysis uses the four types of software to obtain a comparison of the results of the analysis. The analysis in this study focuses on the analysis of hypothesis testing and regression analysis. Regression analysis is used to measure how much influence the independent variable has on the dependent variable. The field of this research is education management and the research data uses quantitative data derived from questionnaire data for a small sample of 32 respondents with three research variables, namely the independent variable of transformational leadership and job satisfaction, while the dependent variable is teacher performance. Based on the results of the analysis using Lisrel, Tetrad, GSCA, Amos, SmartPLS, WarpPLS, and SPSS software, the results showed that for a small sample there was no significant difference in the significance value of p-value and t-value. There is also no significant difference in the determination value, and the correlation value in the resulting structural equation also has no significant difference in results, while for CB-SEM represented by Lisrel, Tetrad cannot process data with a small sample size.

Keywords: Education Management, Data analysis, Tetrad Amos, SmartPLS, WarpPLS,

INTRODUCTION
Many researches in the field of education management use statistical software tools such as Lisrel, Tetrad, GSCA, Amos, SmartPLS, WarpPLS, and SPSS. Many researchers in the field of education management are still hesitant in choosing which software to use. There are many researches in the field of education that use SmartPLS, such as those conducted by Budi Santoso, P., Asbari, M., Siswanto, E., & Fahmi, K. (2021). examines the role of job satisfaction and organizational citizenship behavior on performance. Putra, F., Asbari, M., Purwanto, A., Novitasari, D., & Santoso, P. B. (2021) investigated linking social support and performance in college. Johan, M. (2021) examines the effect of knowledge sharing and interpersonal trust on innovation. Purwanto, A., Santoso, PB, Siswanto, E., Hartuti, H., Setiana, YN, Sudargini, Y., & Fahmi, K. (2021) the effect of hard skills, soft skills,
organizational learning and innovation capability on performance lecturer. Novitasari, D., Asbari, M., Purwanto, A., Fahmalatif, F., Sudargini, Y., Hidayat, L. H., & Wiratama, J. (2021). examined the effect of social support factors on the performance of elementary school teachers. Anas Ahmadi, E., Herwidyaningtyas, F.B., & Fatimah, S. (2020) examined the influence of organizational culture, work motivation, and job satisfaction on lecturer management performance. Jayus, J.A. (2021). Examining the effect of distributive justice, procedural justice and interactional justice on teacher involvement and teacher performance. Ahmed, U., Umran, W. A., Qureshi, M. A., & Samad, A. (2018). examined the relationship between teacher support, academic efficacy, academic resilience, and student engagement in Bahrain. Ahmed, U., Umran, W. A., Qureshi, M. A., & Samad, A. (2018) examined the relationship between teacher support, academic efficacy, academic resilience, and student engagement in Bahrain. Purwanto, A., J.T. Purba, I. Bernardo, and R. Sijabat. (2021) examines the effect of management innovation, transformational leadership and knowledge sharing on performance. Purwanto, John Tampil Purba, Innocentius Bernarto, Rosdiana Sijabat (2021) examined the role of organizational citizenship behavior (OCB), transformational and digital leadership on performance through mediating organizational commitment.

There have been many studies in the field of education using AMOS, such as Mustafa, M. B., Nordin, M. B., & Razzaq, A. B. A. (2020) researching structural equation modeling using AMOS: confirmatory factor analysis for the workload of teachers in special education integration programs. Fathema, N., Shannon, D., & Ross, M. (2015) extending the technology acceptance model (TAM) to examine the use of faculty learning management systems (LMSs) in higher education institutions. Standage, M., & Treasure, D. C. (2002) the relationship between achievement goal orientation and multidimensional situational motivation in physical education. Kulina, P. H., & Cothran, D. J. (2003) self-reported physical education teacher use and perceptions of various teaching styles. Skaalvik, E. M., & Skaalvik, S. (2010) teacher self-efficacy. Iordanoglou, D. (2007) relationship between emotional intelligence and leadership effectiveness, commitment, and satisfaction. Kokkinos, C. M., Charalambous, K., & Davazoglou, A. (2009) interpersonal teacher behavior in elementary school classrooms on teachers. Mustafa, M. Z. B., Nordin, M. B., Razzaq, A. R. B. A., & bin Ibrahim, B. (2020) organizational commitment of SMK teachers. Woolley, M. E., Strutchens, M., Gilbert, M. C., & Martin, W. G. (2010) The mathematical success of black middle school students is a direct and indirect effect of teacher expectations and reform practices.

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student aggression, victimization, and willingness to intervene in bullying situations. Comparative study of attitudes, attention, and interaction levels of elementary school teachers and students teacher candidates towards Inclusive Education. Chong, W. H., Klassen, R. M., Huan, V. S., Wong, I., & Kates, A. D. (2010) relationship between school type, teacher efficacy beliefs, and academic climate of Asian secondary schools. There are many researches in education that use WarpPLS, such as that done by Kock, N. (2010) using WarpPLS in e-collaboration studies. Kock, N. (2011) used WarpPLS in an e-collaborative study of descriptive statistics, settings, and key analysis results. Mahipalan, M., & Sheena, S. (2019) workplace spirituality, psychological well-being and the mediating role of subjective stress. Ifinedo, E., Rikala, J., & Hämäläinen, T. (2020) Factors influencing teacher educator technology integration Nigeria considers the characteristics, knowledge constructions, practices and beliefs of ICT. Lim, S. C., & Thien, L. M. (2020) Chinese academic leadership from the perspective of Confucian virtues and their effect on teacher commitment. Thien, L. M., & Adams, D. (2021) distributing teacher affective leadership and commitment to change in Malaysian primary schools: contextual effects of gender and teaching experience. Manalo, R. A., de Castro, B., & Uy, C. (2020) the mediating role of job satisfaction on the effect of motivation on organizational commitment and work involvement of private secondary school teachers. Ali, G. (2017) moderating effect of organizational identification on the relationship between teachers' perceived organizational justice and burnout behavior at the college level. Matriadi, F., Salim, S. R. A., Dalimunthe, R. F., & Gultom, P. (2019) The effect of compensation and supply chain management on the educational system mediating role of work motivation.

There have been many educational studies using the GSCA, such as those conducted by Sturman, E. D., & Zappala-Piemme, K. (2017) the development of grit scales for children and adults and their relationship to student success, exam anxiety, and academic performance. Kusumawati, A., Pribadi, A., & Astuti, H. M. (2013) analyzed the effect of information system quality, user satisfaction and the net benefits of E-Learning users. Idrus, S., Alhabji, T., Al Musadieq, M., & Utami, H. (2015) the effect of psychological empowerment on self-efficacy, saturation, emotional intelligence, job satisfaction, and individual performance. Ismail, N. A., & Awang, H. (2008) mathematics achievement among students. Djati, A. H. S. M. S., & Setyoleksono, A. (2014) learning attitudes and awareness of students in the success of a cultured environment. Webb-Landman, E. (2012) used group counseling to increase attendance of elementary school students with high absenteeism. Hermawati, A., & Mas, N. (2017) the mediating effect of quality of work life, work involvement, and organizational citizenship behavior in the relationship between transglobal leadership and employee performance. Safarudin, A., Astuti, E. S., Raharjo, K., & Al Musadieq, M. (2015) The effect of transactional leadership style and work environment on computer self-efficacy, job satisfaction, behavior and performance of computer operators. Owens, D., Stewart, T. A., & Bryant, R. M. (2011) perceptions, attitudes, and experiences of urban African
American high school girls with professional school counselors.

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**METHOD**

This research method is quantitative, research data analysis uses Lisrel, Tetrad, GSCA, Amos, SmartPLS, WarpPLS, and SPSS software to obtain a comparison of the results of the analysis. The analysis in this study
focuses on the analysis of hypothesis testing and regression analysis. Regression analysis is used to measure how much influence the independent variable has on the dependent variable. The data from this study used quantitative data derived from questionnaire data with a small sample of 32 respondents. In the data there are 3 variables, namely three research variables, namely the independent variables of transformational leadership and job satisfaction, while the dependent variable is the performance developed from Purwanto et al. (2020); Asbari et al. (2021) and Novitasari et al (2020) with the following research model:

\[ X \rightarrow Y_1 \rightarrow Y_2 \]

\[ X \rightarrow Y_2 \]

\[ X \rightarrow Y_1 \rightarrow Y_2 \]

\[ X \rightarrow Y_2 \rightarrow Y_1 \]

**Result and Discussion**

**A. Testing the Significance of t-Value**

The first stage of data analysis is testing the significance of the relationship between the independent variable transformational leadership (X), job satisfaction (Y1) with the dependent variable teacher performance (Y2) by looking for t-Value using Lisrel, Tetrad, GSCA, Amos, SmartPLS, WarpPLS, and SPSS, the decision criteria if the t-Value value is greater than 1.96 or \( > 1.96 \) then the relationship is significant, if less than 1.96 or \( < 1.96 \) then the relationship is not significant. For WarpPLS does not produce a t-statistic value, the significance test can be seen on the p-value, so that the t-statistic value will be obtained.

The test results with 4 software for a direct relationship can be seen in Table 1 below:
Relationship between transformational leadership (X) and job satisfaction (Y1)
Based on the results of the software analysis, the results of the t-Value using Amos data cannot be processed. The t-Value using SmartPLS is 89.509, which is greater than 1.96, so it can be concluded that the relationship between X and Y1 is significant. The result of t-Value using SPSS is 21.424 which is greater than 1.96 so that it can be concluded that the relationship is significant so that it can be concluded that SmartPLS and SPSS give the same results.

Relationship between transformational leadership (X) and performance (Y2). Based on the results of the software analysis, the results of the t-Value using Amos using Amos data cannot be processed. The t-Value using SmartPLS is 1.960, which is greater than 1.96, so it can be concluded that the relationship between X and Y2 is significant. The results of the t-Value using SPSS of 2.125 are greater than 1.96 so that it can be concluded that the relationship between X and Y2 is significant, so it can be concluded that SmartPLS and SPSS give the same results.

The relationship between transformational leadership (X) and performance (Y2) through job satisfaction (Y1)

Based on the results of the software analysis, the results of the t-Value using Amos data cannot be processed. The result of t-Value using SmartPLS is 0.822 which is smaller than 1.96 so that it can be concluded that the relationship between X and Y2 through Y1 is not significant. The result of t-Value using SPSS of 1.051 is smaller than 1.96, so it can be concluded that the relationship between X and Y2 through Y1 is not significant, so it can be concluded that SmartPLS and SPSS give the same results.

B. Testing the Significance of p-Value
The second stage is data analysis, namely testing the significance of the relationship between the independent variable transformational leadership (X), job satisfaction (Y1) with the dependent variable teacher performance (Y2) by looking for p-value using SPSS, Amos, SmartPLS, WarpPLS and SPSS software. The decision is that if the p-value is less than 0.050 or <0.050 then the relationship is significant, if it is more than 0.050 or >0.050 then the relationship is not significant.

The test results with 4 software for direct connection are as follows:
|                  | Amos | Lisrel | GSCA | Tetrad | SmartPLS  | WarpPLS | SPSS | Result |
|------------------|------|--------|------|--------|-----------|---------|------|--------|
| X1-Y1            | -    | -      | -    | -      | 0.000     | < 0.010 | 0.000| Sig    |
| X1-Y2            | -    | -      | -    | -      | 0.046     | < 0.010 | 0.042| Sig    |
| X-Y1-Y2          | -    | -      | -    | -      | 0.411     | 0.450   | 0.302| Not Sig|

Relationship between transformational leadership (X) and job satisfaction (Y1)
Based on the results of the software analysis, the p-value results using Amos data cannot be processed. The p-value using SmartPLS is 0.000 less than 0.050 so it can be concluded that the relationship between X and Y1 is significant. The p-value using WarpPLS is 0.000 less than 0.050 so it can be concluded that the relationship is significant. The p-value using SPSS is 0.000 less than 0.050, so it can be concluded that the relationship between X1 and Y1 is significant, so it can be concluded that WarpPLS, SmartPLS and SPSS give the same results.

The relationship between transformational leadership (X1) and performance (Y2)
Based on the results of the software analysis, the p-value results using Amos data cannot be processed. The p-value using SmartPLS is 0.046 which is smaller than 0.050, so it can be concluded that the relationship between X and Y2 is significant. The result of p-value using WarpPLS is 0.410 less than 0.050 so that it can be concluded that the relationship between X and Y2 is significant. The result of the p-value using SPSS is 0.450 less than 0.050, so that it can be concluded that the relationship between X and Y2 is significant. The result of p-value using SmartPLS is 0.042 less than 0.050, so it can be concluded that the relationship between X and Y2 is significant, so it can be concluded that WarpPLS, SmartPLS and SPSS give the same result.

Coefficient of Determination Test
Testing the coefficient of determination to calculate the influence of the independent variable on the dependent variable. In this study, the R Square termination coefficient was calculated for the independent variables of transformational leadership (X), Job Satisfaction (Y1) and Performance (Y2). The results of the R Square test using Amos, SmartPLS, WarpPLS and SPSS are as follows:
Based on the results in Table 4, the R Square value for Job Satisfaction (Y1) using Amos cannot be run. The value of R Square for Job Satisfaction (Y1) using SmartPLS is 0.941 or 94.1%, meaning that the Job Satisfaction variable (Y1) is influenced by the transformational leadership variable (X) of 94.1% while the remaining 5.9% is influenced by other variables that are not discussed in this study. The R Square value for Job Satisfaction (Y1) using WarpPLS is 0.95 or 95%, meaning that the Job Satisfaction variable (Y1) is influenced by the transformational leadership variable (X) by 95% while the remaining 5% is influenced by other variables not discussed in this section. The R Square value for Job Satisfaction (Y1) using SPSS is 0.939 or 93.9%, meaning that the Job Satisfaction variable (Y1) is influenced by the transformational leadership variable (X) by 93.9% while the remaining 6.1% is influenced by other variables not discussed in this study. Based on the results in Table 4, the R Square value for Performance (Y2) using SmartPLS is 0.85 or 85%, meaning that the performance variable (Y2) is influenced by transformational leadership variables (X) and job satisfaction (Y1) by 85% while the remaining 15% is influenced by other variables which were not discussed in this study. The value of R Square for Performance (Y2) using SmartPLS is 0.844 or 84.4%, meaning that the performance variable (Y2) is influenced by transformational leadership variables (X) and job satisfaction (Y1) by 84.4% while the remaining 15.6% is influenced by other variables not discussed in this study.

### Correlation Coefficient Test

The correlation coefficient shows the strength of the linear relationship and the direction of the relationship between variables. If the correlation coefficient is positive, then the two variables have a unidirectional relationship (Purwanto et al, 2020). This means that if the value of the variable X is high, then the value of the variable Y will be high as well. Conversely, if the correlation coefficient is negative, then the two variables have an inverse relationship. This means that if the value of the variable X is high, then the value of the variable Y will be low and vice versa. According to Hair et al (2017) to make it easier to interpret the strength of the relationship between two variables, the following criteria are provided:

| Amos   | Lisrel | Tetrads | GSCA  | SmartPLS | WarpPLS | SPSS  |
|--------|--------|---------|-------|----------|---------|-------|
| Y1     | -      | -       | 0.945 | 0.941    | 0.95    | 0.939 |
| Y2     | -      | -       | 0.859 | 0.852    | 0.85    | 0.844 |
The results of testing the correlation coefficient for structural equations using Amos, SmartPLS, WarpPLS and SPSS software are as follows:

| Software   | equation                                      |
|------------|-----------------------------------------------|
| Amos       | -                                             |
| SmartPLS   | \(Y_1 = a + 0.970X + e\) \(Y_2 = a + 0.642X_1 + 0.287Y_1 + e\) |
| Lisrel     | -                                             |
| Tetrad     | -                                             |
| GSCA       | \(Y_1 = a + 0.972X_1 + e\) \(Y_2 = a + 0.703X + 0.229Y_1 + e\) |
| WarpPLS    | \(Y_1 = a + 0.973X + e\) \(Y_2 = a + 0.658X + 0.271Y_1\) |
| SPSS       | \(Y_1 = 1.83 + 0.950X + e\) \(Y_2 = 0.219 + 0.642X_1 + 0.324Y_1 + e\) |

The results of structural equations using Lisrel, Tetrad and Amos software cannot be run. The results of the structural equation using SmartPLS software obtained the equation is \(Y_2 = 0.642X_1 + 0.287X_2 + e\), meaning that the correlation coefficient value of the influence of transformational leadership variable (X) on performance (Y2) is 0.642, meaning that there is a strong correlation and indicates that if the value of transformational leadership (X) increases by 1 unit, while the value of job satisfaction (X2) remains, the performance value (Y2) will increase by 0.642 units. This means that the partial effect of transformational leadership on performance is 64.2%. The correlation coefficient value of the influence of job satisfaction variable (Y1) on performance (Y2) is 0.287, meaning that there is a sufficient correlation and shows that if the value of job satisfaction (Y1) increases by 1 unit, while the value of transformational leadership (X) remains, the performance value (Y2) will increase by 0.287 units. This means that the effect of job satisfaction (Y1) on performance partially is 28.7%.

The results of the structural equation using WarpPLS software obtained the equation is \(Y_2 = 0.658X_1 + 0.271X_2 + e\), meaning that the correlation coefficient value of the influence of transformational leadership
variable (X) on performance (Y2) is 0.658, meaning that there is a strong correlation and shows that if the value of transformational leadership (X) increases by 1 unit, while the value of job satisfaction (X2) remains, the performance value (Y2) will increase by 0.658 units. This means that the partial effect of transformational leadership on performance is 65.8%. The correlation coefficient value of the effect of job satisfaction variable (Y1) on performance (Y2) is 0.271, meaning that there is a sufficient correlation and indicates that if the value of job satisfaction (Y1) increases by 1 unit, while the value of transformational leadership (X) remains, the performance value (Y2) will increase by 0.271 units. This means that the effect of job satisfaction (Y1) on performance partially is 27.1%.

The results of the structural equation using SPSS software obtained the equation is Y2=0.219+ 0.642X1 + 0.324Y1 + e, meaning that the correlation coefficient value of the influence of transformational leadership variable (X) on performance (Y2) is 0.642, meaning that there is a strong correlation and indicates that if the value of transformational leadership (X) increases by 1 unit, while the value of job satisfaction (X2) remains, the performance value (Y2) will increase by 0.642 units plus a constant of 0.219 units. This means that the partial effect of transformational leadership on performance is 64.2%. The correlation coefficient value of the influence of job satisfaction variable (Y1) on performance (Y2) is 0.324 meaning that there is a sufficient correlation and indicates that if the value of job satisfaction (Y1) increases by 1 unit, while the value of transformational leadership (X) remains, the performance value (Y2) will increase by 0.324 units plus the constant 0.219 units. This means that the effect of job satisfaction (Y1) on performance partially is 32.4%.

The results of the structural equation using the GSCA software obtained the equation is Y2=a+ 0.703X+ 0.229Y1 + e, meaning that the correlation coefficient value of the influence of transformational leadership variable (X) on performance (Y2) is 0.704, meaning that there is a strong correlation and shows that if the value of transformational leadership (X) increases by 1 unit, while the value of job satisfaction (X2) remains, the performance value (Y2) will increase by 0.703 units. This means that the partial effect of transformational leadership on performance is 70.3%. The correlation coefficient value of the influence of job satisfaction variable (Y1) on performance (Y2) is 0.229 meaning that there is a sufficient correlation and indicates that if the value of job satisfaction (Y1) increases by 1 unit, while the value of transformational leadership (X) remains, the performance value (Y2) will increase by 0.229 units plus the constant 0.229 units. This means that the effect of job satisfaction (Y1) on performance partially is 22.9%.

CONCLUSION

Based on the results of the analysis using GSCA, SPSS, SmartPLS and WarpPLS software, the results showed that for a small sample there was no significant difference in the significance value of p-value and t-value. There is also no significant difference in the determination value produced, and the correlation value in the resulting structural equation also has no significant difference in results, while for CB-SEM represented by
Lisrel, tetrad and Amos cannot process data with a small sample size.

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