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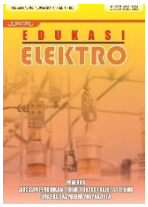

Measurement Model of Technopreneurship Intentions and the Performance of Electrical Lighting Installation Practices in Vocational High School

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Abstract— The aims of this study are to produce measurement model of the intention of technopreneurship and the performance of the practice of electric lighting installations. Analysis of the data used is confirmatory factor analysis. Confirmatory Factor Analysis has several stages to determine the results. These stages include determining goodness of fit, calculating path estimation, calculating loading factor, Average Variance Extracted (AVE), and calculating reliability using Construct Reliability (CR). Goodness of fit is determined by looking for the Goodness-of-Fit Index (GFI), Norm Fit Index (NFI), Comparative Fit Index (CFI), or Root-Mean-Square Error of Approximation (RMSEA). CFI, RMSEA, loading factor, and t_{count} values met the suitability index criteria. These results indicate that the model for measuring technopreneurship intention variables and the performance of electrical lighting installation practices theoretically matches the field data, so that the measurement model is acceptable.

Keywords: electrical installation, performance, technopreneurship, vocational

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1 INTRODUCTION

Vocational schools need to have a special strategy to solve the unemployment problem. The purpose of revitalizing Vocational Schools is to support students to become technopreneurs according to their skills[1]. Vocational Schools need to support the program by providing entrepreneurship knowledge in Vocational Schools. Vocational Schools currently do not support collaborative learning between practice and theory, especially entrepreneurship. This is because the teacher has not been able to assess the ability of students in entrepreneurship. Another major problem that arises is that teachers also do not have standardized practice assessments, one of which is electric lighting. Teachers need to know the circumstances of students and individual practices to develop technopreneurship. This can be arranged based on the assessment carried out for both measuring and technopreneurship.

Knowledge in Vocational Schools is divided into three types, namely normative, adaptive, and psychomotor[2]. The psychomotor aspect has a larger portion of learning in education in Vocational Schools, especially in the performance of electric lighting installation practices. Electrical lighting installation is one of the subjects in class XI of Electrical Power Installation Engineering expertise competence. The scope of material in this subject includes household installations, buildings, public street lighting, field lighting, and billboards.

The performance of the electric lighting installation practice requires students to be able to solve problems. There are two sub-problems in the electrical field, namely analytical problem solving and constructive problem solving[3]. Constructive problem solving can be broken down into problem specifications and practices. Analytical problem solving consists of schema analysis of the causes of the problem and the search for alternative solutions to problems. Evaluation of the performance results of electric lighting installation practices also needs to be carried out by considering the quality, performance, and safety of the product or project produced [4][5].

Based on theoretical and curriculum studies, there are several specific aspects that need to be mastered in the practical performance of electric lighting installations. Aspects that need to be mastered in the performance of electric lighting installation practices include the preparation of tools and materials, understanding the problem, the installation process, wiring, piping, cable connection, the process of testing components and circuits, searching for troubleshooting, the use of hand tools. and measuring tools, as well as work safety[3][6][7]. These aspects can be classified into the performance scheme of electric lighting installation practices. Preparation of tools and materials can be classified in the problem specification scheme. The use of hand tools, the installation process, wiring, and piping are included in the practical scheme. Understanding the problem is classified in the problem analysis scheme. Distraction search includes alternative solution search schemes. The use of measuring instruments and testing of components and circuits are included in the evaluation scheme.

The learning process of electric lighting installations depends on the teacher as a facilitator. Teachers are required to be able to manage the class well and have adequate knowledge and skills so that the learning process can be successful[8]. Teachers can manage learning activities for electric lighting installations that can be carried out in the classroom or outside the classroom. The learning process outside the classroom can be done by students by applying technopreneurship. Technopreneurship is a combination of entrepreneurship and technology[9][10]. Technopreneurship is one of the efforts that can be done to support the revitalization program for Vocational School graduates. Vocational schools have a major role in shaping the mindset of students to do technopreneurship. Vocational schools provide experience and skills to students so that they can encourage technopreneurship intentions [1][11].

The items of practice performance assessment instrument consisted of three indicators: constructive problem solving, analytical problem solving, and product evaluation. There are 9 items of instrument: (1) preparation and identification of tools according to requirements, (2) planning work diagrams and electrical systems, (3) understanding of work diagrams and electrical systems, (4) using of hand tools, (5) installing cables in accordance with work requirements, (6) using of electrical measuring devices, (7) troubleshooting the circuit, (8) repairing of troubles according to requirements, and (9) installation of strong and neat lighting components. These items were used to assess the performance of electrical lighting installation practices for vocational high school students [12].

Technopreneurship intentions can be influenced by three aspects, namely attitudes towards behavior, subjective norms, and perceptions of behavioral control [13]. Attitudes towards behavior are reviewed through affective attitudes which are seen from individual emotions in doing technopreneurship and instrumental views from beliefs about the benefits of technopreneurship. Subjective norms are viewed through inductive norms which are viewed based on the opinions of others regarding technopreneurship and descriptive norms are viewed based on individual opinions of technopreneurship. Perception of behavioral control is supported by self-efficacy as seen from the individual's ability to perform technopreneurship, belief control in terms of factors that can support or hinder technopreneurship, and strong perception as measured by individual beliefs to do technopreneurship based on supporting and inhibiting factors [14][15]. Teachers as the main party dealing directly with students can provide reinforcement to do technopreneurship. The reinforcement provided by the teacher will be maximized if the teacher knows the state of the students' technopreneurship intentions.

Technopreneurship intention can be measured using three indicators focused on technopreneurship. There are attitudes toward behavior, subjective norms, and perceptions of behavioral control. The attitude towards behavior indicator has sub-indicators of affective attitude and instrumental

attitude on technopreneurship. Subjective norm indicators have sub-indicators of descriptive norms and indicative norms. Perceived indicators of behavior control have three sub-indicators, namely: self-efficacy, belief control, and perception strength. Technopreneurship intention can be measured using 15 items of instrument [16].

2 Methodology

The subjects used in this study were students in class XI of the Electrical Installation Engineering Expertise Competence in Yogyakarta. The total population is 296 students. This study uses 2 techniques in data collection. The data collection technique uses observation and questionnaire techniques.

Analysis of the data used is Confirmatory Factor Analysis (CFA). Prerequisite tests that must be carried out in confirmatory factor analysis are the assumption of Normality, multicollinearity, identification of outlier data, and missing or incomplete data. Two main assumptions must be met in using confirmatory factor analysis, namely multivariate normality and multicollinearity. The estimation method used is Maximum Likelihood (ML).

CFA has several stages to determine the results, namely determining the goodness of fit, calculating path estimates, calculating loading factor, Average Variance Extracted (AVE), and calculating reliability using Construct Reliability (CR). Determining the goodness of fit is done by looking for the Goodness-of-Fit Index (GFI), Norm Fit Index (NFI), Comparative Fit Index (CFI), or Root-Mean-Square Error of Approximation (RMSEA).

3 Results and Discussion

3.1 Normality Test

The normality test was carried out to find out that the studied data were distributed close to the normal curve. The normality assumption tests performed included univariate and multivariate normality tests. Data that meets the assumption of multivariate normality, then univariate normality is also fulfilled. The initial hypothesis (Ho) states that there is skewness and curtosis in the data on technopreneurship intentions and the practical performance of electric lighting installations. This hypothesis is demonstrated by calculating data on the variable technopreneurship intention and the performance of electric lighting installation practices. Table 1 is a table of multivariate normality assumptions on technopreneurship intention variables and the performance of electric lighting installation practices.

Table 1. Multivariate Normality Assumptions on Technopreneurship Intention Variables and The Performance of Electric Lighting Installation Practices

Indicator	Skewness	Z-Skewness	Curtosis	Z-Curtosis
Constructive Problem Solving	-0,049	-0,273	-1,292	-3,597
Analytical Problem Solving	0,007	0,039	-1,104	-3,072
Product Evaluation	-1,138	-6,337	0,823	2,290
Attitudes Towards Behavior	0,246	1,371	0,217	0,604
Subjective Norms	-0,352	-1,961	0,078	0,216
Perceived Behavior Control	-0,128	-0,712	-0,028	-0,079
Multivariate			0,555	0,386

The normality assumption test according to Table 1 shows that the normality of the multivariate Z-curtosis is 0.386. This value is smaller than the critical Z value for a significant level of 5%, which is 1.96. This shows that the initial hypothesis states that there is an acceptable rate of skewness and curtosis. The variable data of technopreneurship intentions and the performance of electric lighting installation practices fulfill the assumption of multivariate normality.

3.2 The Multicollinearity Test

The multicollinearity test is used to prove that the variables or indicators used do not have a high correlation with one another. The test was carried out by paying attention to the correlation value of each indicator on the technopreneurship intention variable and the practical performance of electric lighting installations. The calculation results show that the correlation value between items is less than 0.9. This proves that each indicator on the technopreneurship intention variable and the performance of electric lighting installation practices has no correlation with other items. There is no multicollinearity between indicators on technopreneurship intention and electric lighting installation practice performance.

3.3 Measurement Model

The model was developed based on theoretical studies. The fit index reference used for modeling includes CFI values > 0.9, RMSEA ≤ 0.1, loading factor≥ 0.3[17]. The path analysis value that can be used as a reference is $t_{count} > t_{table}$ with a significance value of 0.05. The following is a model for measuring technopreneurship intentions and the performance of electric lighting installation practices.

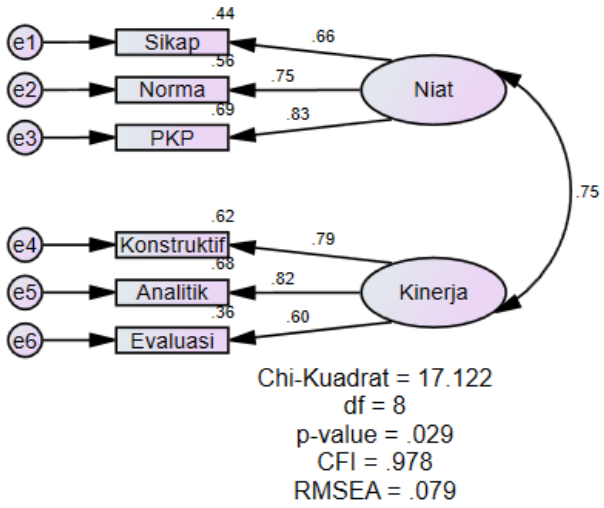

Fig. 1. Standardized Path Diagram Results of Modification of Measurement Model Research Intentions Technopreneurship and Performance of Electrical Lighting Installation Practices

Figure 1 shows intention consisting of attitudes toward behavior *(sikap*), subjective norms *(norma*), and perceptions control behavioral or *Persepsi Kontrol Perilaku* (*PKP*), while performance consists of constructive problem solving (*konstruktif*), analytical problem solving (*analitik*), and product evaluation (*evaluasi*). Figure 1. shows the calculation of the CFI value of 0.978 and the RMSEA of 0.079. Both values indicate that they have been met according to the specified match index. These results prove that the research measurement model is acceptable. This result is reinforced by the loading factor values based on Table 2 which also meet the criteria. The loading factor value on the six indicators is greater than or equal to 0.3. The t_{count} value in Table 2 is also above 1.96. The significance level is <0.001. The p_{value} in Table 2 shows that it has a significant value of less than 0.05. Table 2 contains a summary of the testing model for measuring technopreneurship intentions and the performance of electric lighting installation practices.

Table 2. Loading Factor of Variable Technopreneurship Intention and Performance of Electrical Lighting Installation Practices

Relationship			λ	t_{count}	p
PCB	<---	Intention	0,83	8,63	< 0,001
Norms	<---	Intention	0,75	8,24	< 0,001
Attitude	<---	Intention	0,66		
Evaluation	<---	Performance	0,60	7,73	< 0,001
Analytic	<---	Performance	0,82	10,00	< 0,001
Constructive	<---	Performance	0,79		

The standardized factor load on the attitude towards behavior indicator is 0.66; subjective norm of 0.75; and perceived behavioral control of 0.83. Each of these indicators can represent the technopreneurship intention variable. The CR was 0.79 and the AVE 0.56. A good AVE value is above 0.50 and the CR value that needs to be fulfilled is 0.60[17]. The results of these calculations prove that the indicators of attitudes towards behavior, subjective norms, and perceptions of behavioral control can translate the technopreneurship intention variable according to the theory of planned behavior[13]. Constructive problem-solving factor load of 0.79; analytical problem solving of 0.82; and product evaluation of 0.60. These three indicators can represent the performance variables of electric lighting installation practices. The CR was 0.79 and the average extracted variant was 0.55. The results of these calculations prove that indicators of constructive problem solving, analytical problem solving, and product evaluation can translate the performance variables of electric lighting installation practices[3][4].

CFI, RMSEA, factor loading, and t_{count} values met the suitability index criteria. These results indicate that the model for measuring technopreneurship intention variables and the performance of electrical lighting installation practices theoretically matches the field data, so that the model is acceptable. Construct reliability and average variance extracted index in this study are shown in Table 3.

Table 3. The Results of Construct Reliability and Average Variance Extracted

Variable	Construct Reliability	Average Variance Extracted
Technopreneurship Intention	0,79	0,56
Performance of electrical lighting installation practices	0,79	0,55

Table 3 shows that the construct reliability value on technopreneurship intentions is 0.79 and the practical performance of electric lighting installations is 0.79. This value already meets the reliable criteria, which is greater than or equal to 0.6. The value of AVE on the technopreneurship intention variable was 0.56 and the practical performance of electric lighting installation was 0.55. This value is above the reference value for the average extracted variant, which is above 0.50[17]. Based on this, the reliability for both variables can be categorized as reliable. Instrument items that are maintained can be used because they meet the established criteria.

4 Conclusion

The standardized loading factor on the attitude towards behavior indicator is 0.66; subjective norm of 0.75; and perceived behavioral control of 0.83. Each of these indicators can represent the technopreneurship intention variable. The loading factor of constructive problem solving is 0.79; analytical problem solving of 0.82; and product evaluation of 0.60. These three indicators can represent the performance variables of electric lighting installation practices. The measurement model is known from the results of CFI, RMSEA, factor loading, and t_{count}. CFI, RMSEA, factor loading, and t_{count} values met the suitability index criteria. These results indicate that the model for measuring technopreneurship intention variables and the performance of electrical lighting installation practices theoretically matches the field data, so that the measurement model is acceptable.

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