Confirmatory Factor Analysis for Measure the Marketability of Terengganu Graduates Based on Soft Skills and Graduate Awareness

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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; 2022). 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 indicators tested truly represented the constructs being measured and Confirmatory Factor Analysis was conducted in this study as a prerequisite that must be met. The study findings show that all correlations between Soft Skills (based on Communication Skills, Critical Thinking and Problem Solving Skills, Entrepreneurial Skills, Leadership Skills, Information Management, Professional Ethics and Morals), Graduate Awareness and Graduate Employability, have values less than 0.85 (<0.85). The combined results of 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: Soft Skills, Graduate Awareness, Graduate Employability, Confirmatory Factor Analysis (CFA), Pooled CFA

Introduction

For students who will take on the challenge after graduating, this is the time to get ready. The direction as a student will end with what they dream of, especially getting a job that makes them happy and not sad waiting for a job call. Students have been provided with natural skills and need to be honed

to be used for the benefit of themselves and others. Student self-awareness is the most important thing to achieve the desire for success for themselves, their families, the university and the country. Employers really need students who have skills and abilities. Skills that students need to have, such as interpersonal, are very important skills and need to be mastered by every student. It is the ability of a person to work cooperatively in a group, including verbal and nonverbal communication skills. It can distinguish individuals in terms of emotions, motivation, temperament and intentions, have empathy and be able to know the beliefs, fears and hopes of other individuals, which is sensitive to the feelings and emotions of others (Gardner, 2014). In fact, this ability is very important for counselors, teachers, therapists, politicians and religious experts. There are various skills that a student needs to have. These skills are the main things that every employer often looks for when conducting an interview session for hiring new employees in addition to the skills that exist in the field of study of a student himself. Students need to be smart in finding all these skills to create a good job for themselves.

Soft skills are generic skills that cross various learning domains, encompassing aspects of personality and teamwork. In line with its importance, the Ministry of Higher Education (MHE), has introduced soft skills that need to be applied to students in institutions of higher learning. There are seven main elements of soft skills that have been introduced, namely communication skills, critical thinking and problem-solving skills, teamwork skills, entrepreneurial skills, leadership skills, continuous learning and information management, and professional ethics and morals. These soft skills are considered skills that provide added value to graduates. If these skills are possessed by every graduate, then they are considered excellently competent. According to Haslinda, Muhammad Nubli and Zarina (2015) in a study on the Soft Skills Program introduced at the Malaysian University College of Engineering and Technology (MUCET) of 373 students and 49 academic staff, it was found that the Soft Skills program is an integrated program that is capable of producing prospective engineers to meet the needs of the industry and the aspirations of the country which requires skilled workforce in both aspects of technical skills and soft skills. This soft skill revolves around the issue of how to prepare graduates to be accepted as employees and increase the employability opportunities of students as graduates and it is not only about the extent of the students' academic achievements. Leading universities in the United States set 2 main metrics as a measure of student success. First: is the success of students in getting a job within the first 6 months after graduation and second: the number of students who take courses outside their academic curriculum syllabus. If students can meet these criteria, then students will certainly be successful. Among the soft skills that students need to master are communication skills, critical thinking and problem-solving skills, teamwork skills, entrepreneurial skills, leadership skills, continuous learning and information management and professional ethics and morals.

Perhaps an indescribable joy when receiving a degree that has been dreamed of for so long with sacrifices for 4 years has finally reached its peak. If we trace the memories of stepping into the ivory tower, it also gives joy and a paradigm shift to students in the sense of finding their own function in the world of education. Years of chasing dreams certainly bring various challenges unexpectedly. The burden of studying, doing assignments, getting to know friends and lecturers, involvement in university and college programs often color university life. After that, graduating has become a title, a question lingers in the mind. What direction will the student take after obtaining a degree? Every year and every time a student graduates, there will definitely be a question about where the student will go after holding a degree. This is the question that always haunts current and prospective students to try to avoid this issue in a negative direction, namely an endless direction. Therefore, an initiative needs to be thought of together to assess the ability of a graduate to set the direction that has been

dreamed of all this time. It is often heard that the issue of unemployed graduates seems like there is no solution to this problem. The efforts of the government and various other parties in dealing with the problem of unemployed graduates are not just promises, but if reviewed, the problem of unemployment also turns back to the students themselves as the cause. What is important is the extent to which prospective graduates currently manipulate all aspects provided at the university and also take advantage of issues towards self-development as a student with high intellectuality. This question focuses on the direction of students after graduation in addition to the question that arises about the relevance of the relationship between the study program studied and the world of work. In addition, the personality of students is identified which refers to soft skills in various fields.

What can be said is that in general, students often state their direction as students after graduating is to place themselves in the world of work. However, that is the challenge that has to be faced and in line with the challenges after graduation, it is very tough if important aspects while at university or before entering the university are not taken into account. The story is different with the question of the relevance of the study program studied with the world of work, which is sometimes underestimated by most students who want to enter university. It sounds like students are said to only meet the requirements or simply expect them to be able to enter university. Then the study program chosen and the Ministry will indirectly offer them with the study program. This is the problem that sometimes becomes one of the causes of the difficult world of work to obtain. In addition, it can be said that students ignore all problems and do not think further about the situation at university later, in other words, as long as they can enter university. The most important thing in the world of work is about the personality of the human being. This is actually closely related to the diversity of fields and types of work that allows students to prepare earlier. Soft skills that have just been applied in universities, although previously soft skills were indirectly as a supply as skilled students. However, the approach to focus more on soft skills so that students are not ignored. Each course of study is interwoven with levels and assessments of soft skills for a student. None other than the aim is to uncover the diversity of attitudes, talents and skills that exist within students. Each student has their own soft skills but they also need to be highlighted in the university to facilitate assessment and familiarization, especially involving communication aspects.

Therefore, as students who feel they need to take on the challenge after graduating, this is the time to prepare. The most important thing is that the direction as a student will end up with what they dream of, especially getting a job that makes the student happy and not sad waiting for a job call. Students are already equipped with natural skills and they need to be honed to be used for the benefit of themselves and others. What is important for all these issues is not only the cooperation of students and the university, but also the awareness within the student which is the most important to make their wishes come true towards the success of themselves, their families, the university and the country. Therefore, the study attempts to study the soft skills possessed by Terengganu graduates to enable the government to provide various programs or preparatory courses for them to enter the real world of work.

Research Methodology
The research method used is quantitative and uses research instruments that have been adapted according to the suitability of factors Soft Skills (based on Communication Skills, Critical Thinking and Problem Solving Skills, Entrepreneurial Skills, Leadership Skills, Information Management, Professional Ethics and Morals), Graduate Awareness and Graduate Employability. 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 (Alias & Hartini, 2017). 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.

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; 2022) 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; 2022; 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; 2022). 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.

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; 2022) 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; 2022; 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; 2022; Hoque et al., 2017).

CFA Analysis for the Measurement Model of Soft Skills Based on Communication Skills Construct
The analysis of Fitness Indexes in Table 2 below shows that the Communication Skills 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; 2022; Hoque et al., 2017).

Table 2 *Analysis To Determine Validity for Communication Skills Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.010	Reach the set level
2. Incremental fit	CFI	0.979	Reach the set level

| 3. Parsimonious fit | ChiSq/df | 1.161 | Reach the set level |

The Measurement Model for the Communication Skills 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; 2022; Kashif et al., 2016).
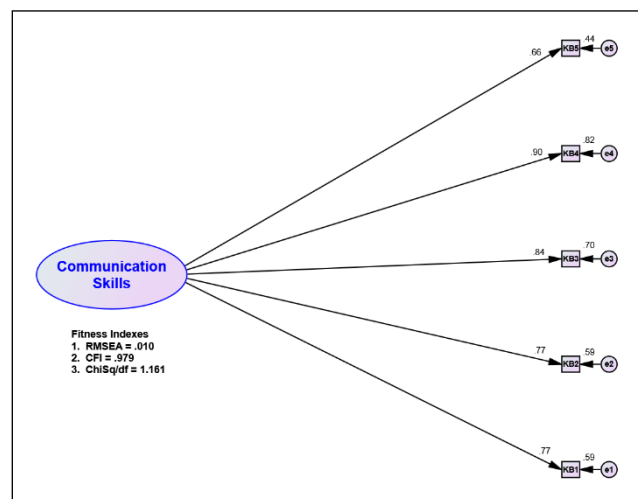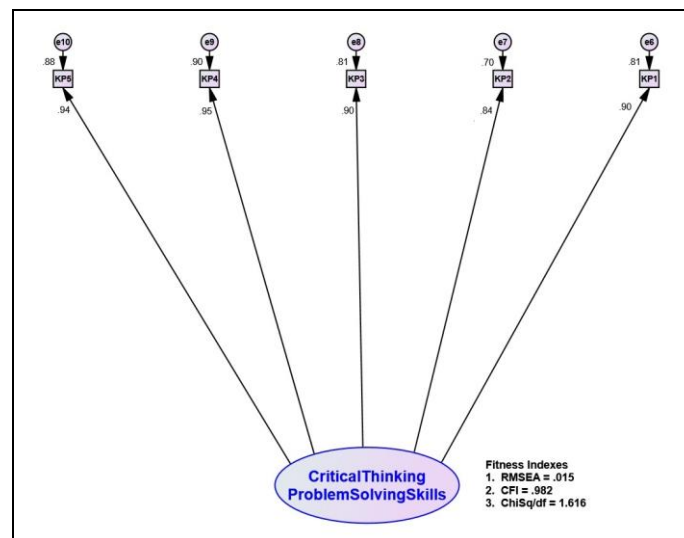

Figure 1. The Measurement Model of Communication Skills Construct

CFA Analysis for the Measurement Model of Soft Skills Based on Critical Thinking and Problem Solving Skills Construct

The analysis of Fitness Indexes in Table 3 below shows that the Critical Thinking and Problem Solving Skills 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; 2022; Hoque et al., 2017).

Table 3 *Analysis To Determine Validity for Critical Thinking and Problem Solving Skills Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.015	Reach the set level
2. Incremental fit	CFI	0.982	Reach the set level
3. Parsimonious fit	ChiSq/df	1.616	Reach the set level

The Measurement Model for the Critical Thinking and Problem Solving Skills 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; 2022; Kashif et al., 2016).
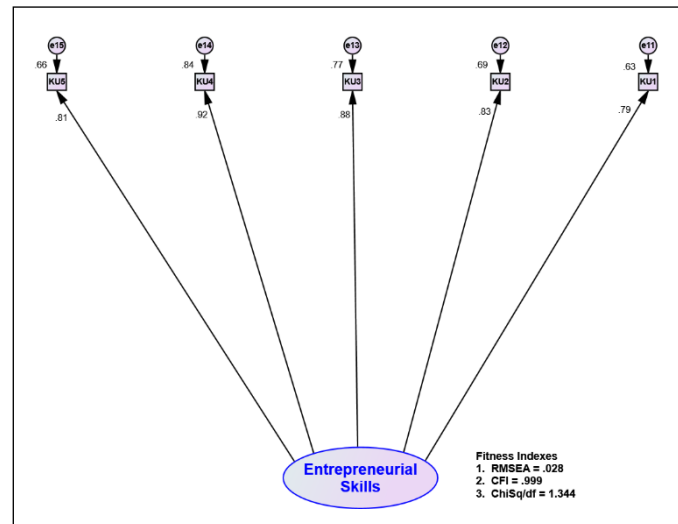
Figure 2. The Measurement Model of Critical Thinking and Problem Solving Skills Construct

CFA Analysis for the Measurement Model of Soft Skills Based on Entrepreneurial Skills Construct
The analysis of Fitness Indexes in Table 4 below shows that the Entrepreneurial Skills 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; 2022; Hoque et al., 2017).

Table 4 *Analysis To Determine Validity for Entrepreneurial Skills Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.028	Reach the set level
2. Incremental fit	CFI	0.999	Reach the set level
3. Parsimonious fit	ChiSq/df	1.344	Reach the set level

The Measurement Model for the Entrepreneurial Skills 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; 2022; Kashif et al., 2016).
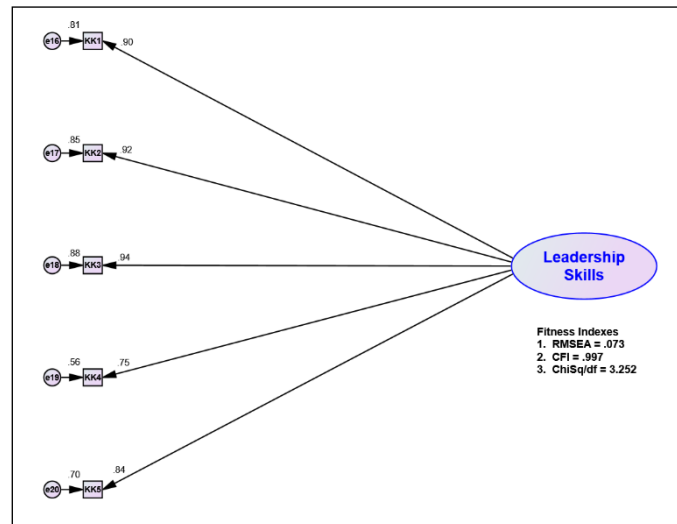
Figure 3. The Measurement Model of Entrepreneurial Skills Construct

CFA Analysis for the Measurement Model of Soft Skills Based on Leadership Skills Construct

The analysis of Fitness Indexes in Table 5 below shows that the Leadership Skills 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; 2022; Hoque et al., 2017).

Table 5 *Analysis To Determine Validity for Leadership Skills Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.073	Reach the set level
2. Incremental fit	CFI	0.997	Reach the set level
3. Parsimonious fit	ChiSq/df	3.252	Reach the set level

The Measurement Model for the Leadership Skills 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; 2022; Kashif et al., 2016).
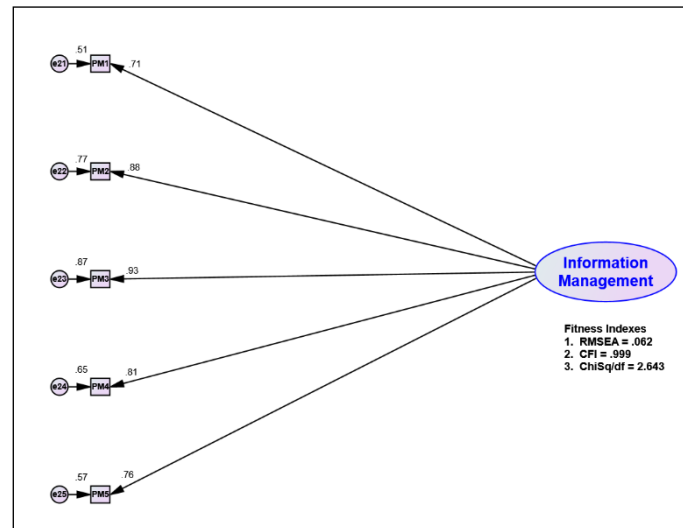
Figure 4. The Measurement Model of Leadership Skills Construct

CFA Analysis for the Measurement Model of Soft Skills Based on Information Management Construct

The analysis of Fitness Indexes in Table 6 below shows that the Information Management 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; 2022; Hoque et al., 2017).

Table 6 *Analysis To Determine Validity for Information Management Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.062	Reach the set level
2. Incremental fit	CFI	0.999	Reach the set level
3. Parsimonious fit	ChiSq/df	2.643	Reach the set level

The Measurement Model for the Information Management 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; 2022; Kashif et al., 2016).

Figure 5. The Measurement Model of Information Management Construct

CFA Analysis for the Measurement Model of Soft Skills Based on Professional Ethics and Morals Construct

The analysis of Fitness Indexes in Table 7 below shows that the Professional Ethics and Morals 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; 2022; Hoque et al., 2017).

Table 7 *Analysis To Determine Validity for Professional Ethics and Morals Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.067	Reach the set level
2. Incremental fit	CFI	0.987	Reach the set level
3. Parsimonious fit	ChiSq/df	4.234	Reach the set level

The Measurement Model for the Professional Ethics and Morals 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; 2022; Kashif et al., 2016).
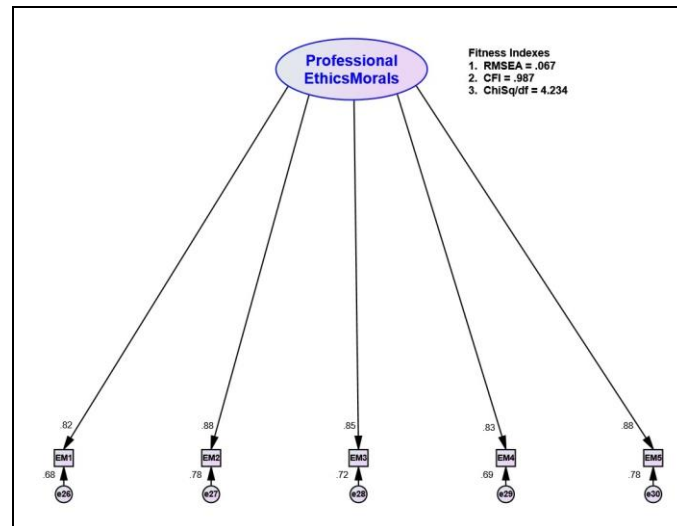
Figure 6. The Measurement Model of Professional Ethics and Morals Construct

CFA Analysis for the Measurement Model of Graduate Awareness Construct

The analysis of Fitness Indexes in Table 8 below shows that the Graduate Awareness 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; 2022; Hoque et al., 2017).

Table 8 *Analysis To Determine Validity for Graduate Awareness Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.073	Reach the set level
2. Incremental fit	CFI	0.997	Reach the set level
3. Parsimonious fit	ChiSq/df	3.294	Reach the set level

The Measurement Model for the Graduate Awareness 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; 2022; Kashif et al., 2016).
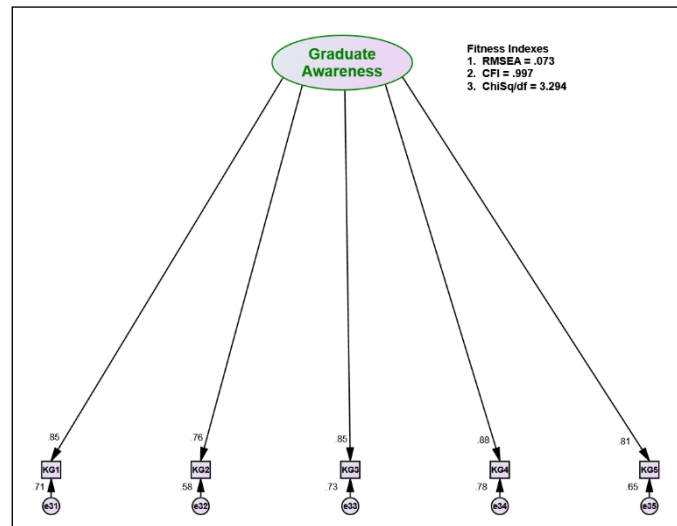
Figure 7. The Measurement Model of Graduate Awareness Construct

CFA Analysis for the Measurement Model of Graduate Employability Construct
The analysis of Fitness Indexes in Table 9 below shows that the Graduate Employability 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; 2022; Hoque et al., 2017).

Table 9 *Analysis To Determine Validity for Graduate Employability Construct*

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.079	Reach the set level
2. Incremental fit	CFI	0.984	Reach the set level
3. Parsimonious fit	ChiSq/df	3.668	Reach the set level

The Measurement Model for the Graduate Employability 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; 2022; Kashif et al., 2016).
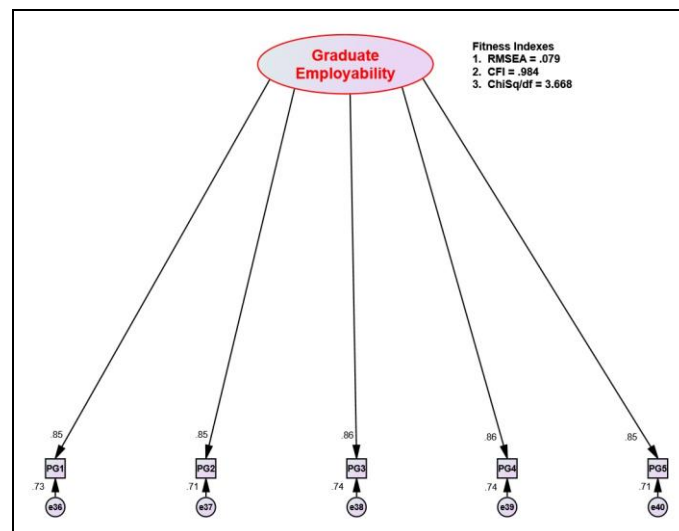
Figure 8. The Measurement Model of Graduate Employability Construct

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; 2022; 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; 2022; Hoque et al., 2017). The results of the Pooled CFA procedure are shown in Figure 9 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 10 below shows that all three categories of model fit index for the construct measurement model have been achieved.

Table 10 *Analysis To Determine Validity for All Constructs*

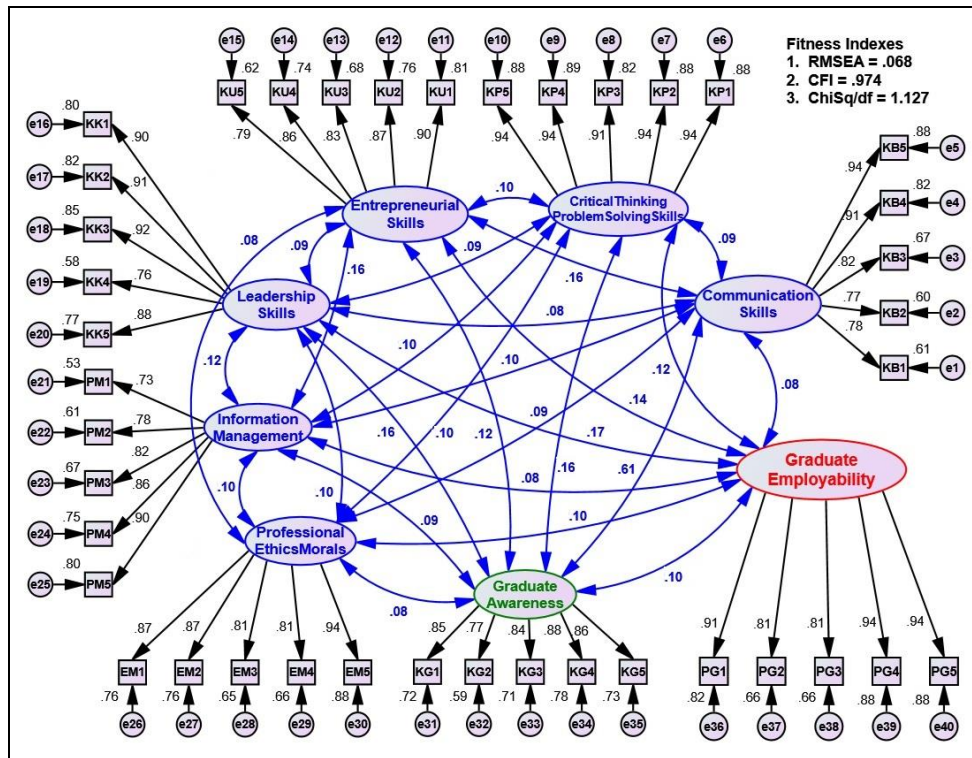| Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.068	Reach the set level
2. Incremental fit	CFI	0.974	Reach the set level
3. Parsimonious fit	ChiSq/df	1.127	Reach the set level

Figure 9. 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; 2022). Table 11 below shows the Discriminant Validity Index Summary between all the constructs in the model.

Table 11 *Discriminant Validity Index Summary*

Constructs	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Communication Skills (a)	**0.83**							
Critical Thinking and Problem Solving Skills (b)	0.09	**0.93**						
Entrepreneurial Skills (c)	0.16	0.10	**0.85**					
Leadership Skills (d)	0.08	0.09	0.09	**0.88**				
Information Management (e)	0.10	0.10	0.16	0.12	**0.82**			
Professional Ethics & Morals (f)	0.09	0.10	0.08	0.10	0.10	**0.86**		
Graduate Awareness (g)	0.08	0.16	0.12	0.16	0.09	0.08	**0.86**	
Graduate Employability (h)	0.08	0.12	0.14	0.17	0.08	0.10	0.10	**0.88**

Table 11 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; 2022), 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 11 show that Discriminant Validity for all constructs in the model has been achieved.

Conclusion

Overall, the CFA analysis conducted on the Soft Skills measurement model (based on Communication Skills, Critical Thinking and Problem Solving Skills, Entrepreneurial Skills, Leadership Skills, Information Management, Professional Ethics and Morals), Graduate Awareness towards Graduate Employability of Terengganu children, has reached the fitness index level. 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. Therefore, before the actual data is analyzed to identify the effects between constructs, the validation of each construct must be carried out first in this study. The CFA analysis has confirmed that each construct used in this study does not overlap (i.e. each questionnaire item used in this study does not show the same meaning in each construct used).

Conflicts of Interest: The author has no conflicts of interest to disclose concerning this study.

Declarations: This manuscript has not been published to any other journal or online sources.

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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