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Measurement Model Assessment: Resources Capabilities and Industrial Competitiveness Impact Towards Private HEI Performance in Malaysia

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Abstract

This study attempts to construct a measurement model for assessment purpose by using SMARTPLS 4 application in order to investigate relationship between Theory of Resources Capabilities and Theory of Industrial Competitiveness toward Private Higher Education Institution Performance in Malaysia. The questionnaire was sent to 109 respondents known as Edupreneurs using purposive sampling. The result of the measurement model shows that all 10 constructs of Resource Capabilities (Independent Variable 1), Industrial Competitiveness (Independent Variable 2), and Private Higher Education Institution Performance(Dependent Variable) meet the thresholds/minimum limits for Composite Reliability (CR) and Average Variance Extracted (AVE),with all CRs greater than 0.7 and all AVEs greater than 0.5. For discriminant validity, the values were less than 0.90, indicating that discriminant validity was also met. In summary, this study contributes to the methodology by helping to develop questions in the survey, identifying the basic assumptions in the area of PHEI performance, demonstrating the validity of the items used, and showing how it can be applied to PHEI strategies in the future.

Keywords: Measurement Model, Resource Capabilities, Industrial Competitiveness, Private HEI Performance, SMARTPLS4

Introduction

In the last two decades, the number of Private Higher Education Institutions (PHEI) in Malaysia has increased significantly. As the number of players increases, the way they interact with

their environment and work with the available sources also changes. Regardless of the Covid 19 pandemic that has hit Malaysia, competition among private HEI is still unabated. The Covid 19 pandemic wiped out 21 private HEIs across Malaysia, leaving only 419 out of 440 PHEIs in 2021 (Pencapaian IPTS membanggakan, 2022). Even though there are only 419 Private HEIs in Malaysia in November 2022, competition is still high as the number of domestic students continuing their education in 2022 has also dropped to 50% compared to 2019 data (Ministry of Higher Education Malaysia, 2023). The number of international students is also not as high between 2017 and 2019, decreasing by 32% by the end of 2022 (Ministry of Higher Education Malaysia, 2023). Nevertheless, Malaysia is still the top choice for international students as there are currently over 120,000 international students in Malaysia (Ministry of Higher Education Malaysia, 2023). This shows that the demand is still there, but PHEIs must compete aggressively in this market.

This is the main problem of private HEI in Malaysia. The low total number of students per year makes it difficult for PHEIs to make a profit and makes it difficult for them to stay longer. PHEIs need to find solutions or strategies that will make it easier for them to compete and stay in business. To that end, they need to focus on two main areas. These areas are the external environment and the internal environment. Both environments affect the performance of the company HEI (Mainardes et al., 2011; Ropianto et al.,2017)

The environment can be discussed by the resource capabilities theory and industrial competitiveness theory as discussed by Mainardes et. al (2011) in their emergence theory of sustainable competitive advantage for private firms HEI. Mainardes et. al (2011) proposed 7 elements of industrial competitiveness theory and 5 elements of resource capabilities theory. However, due to limitations, only 3 elements from both theories are discussed in this paper.

Literature Review

Private Higher Education Performance

Yaakub and Mohamed (2019) proposed four dimensions that act as a balance scorecard suitable for measuring the performance of PHEI. The dimension consists of 22 items related to academic effectiveness, PHEI assessment criteria, research capacity, and financial performance.

The effectiveness dimension refers to the extent to which PHEI management and government contribute to improving their strategies (Blackman and Kennedy, 2009). Esposito et al (2013), also indicates that it is critical for organizations to measure performance to improve accountability and effectiveness.

For the evaluation criteria, Yaakub and Mohamed (2019) suggested measuring the following elements: Quality Management System, Program and Graduate Recognition, Students, and Resources. This element is considered as a non-financial performance criterion.

For research capacity, research capacity is identified in terms of grants and contracts and licensing revenue. For financial performance, profit, return on investment, and sales in three years are measured (Yaakub & Mohamed, 2019).

This measurement was also used by other researchers such as in the study of (Iqbal et al., 2022; Rasdi, et al., 2022; Arokiasamy, et al., 2021)

Theory of Resource Capabilities

Applying the theory of resources and capabilities (or formerly known as Resource Based View theory) to the educational context can contribute to the development of strategies in a HEI (Mainardes et.al 2011). This theory has been used by previous researchers to assess PHEI or

organisational performance, such as from (Lynch & Baines, 2004; Safari & Saleh, 2020; Freeman et al., 2021; D'Oria et. al., 2021).

Among the principles of the theory of resources and capabilities, an important issue for the HEI is managing performance. The leaders of higher education institutions should adopt strategies for their organisation to learn with other organisations, whether competitors or not, to improve their capabilities. The theory suggested that the elements that higher education institutions should possess in their internal environment, such as the educational services offered, the physical structure, technologies, and location of HEI, human resource capabilities, financial resources, recognition of special competence, market orientation, and organisational culture, as well as the reputation of HEI (Arshad et al., 2020).

However, in this work, the elements of Course Offering, Human Resource Capabilities, and Innovation are emphasised.

Theory of Industrial Competitiveness

The original element of the theory of Industrial Territories and Competitiveness consists of the threat of a new type of HEI, the degree of rivalry between the HEI, the bargaining power of the student as a consumer, government regulation, the generic strategy of competitors HEI, the relationship with society and the relationship with the organization and government. This theory is also known as an extension of Porter Diamond Competitiveness Theory. The application of this theory to the education industry has also been discussed in (Yang et al., 2020; Ahmad et al., 2022). This is also discussed to other industries such as Butt et al (2019) and in (Vesperi & Gagnidze, 2021). However, due to the research gap and suitability to the problem at hand, this article highlights only three factors, namely Competition, Bargaining Power, and Industrial Linkage, but not the other factors.

Methodology

This study uses descriptive research design. The respondents are known as Edupreneur or those involve in Education business as entrepreneur. This study uses non-probability sampling and the sampling technique uses is purposive sampling as it more suitable for eduprenuer situation. As the total respondent are unknown, this research use G-Power , and it is advisable to use more than 103 respondent. This is supported by Roscoe (1975) that the number of respondent should be 10 times to the variable.

Questionnaire Design

Table 1

Questionnaire Design

Section / Part	Construct	Number of Item
Section A (Demographic Profile		
	Edupreneur	109
Section B (Resource Capabilities)		
1	Courses Offered	8
2	Human Resource Capabilities	15
3	Innovation	13
Section C (Industrial Competitiveness)		
4	Competition (CP)	10
5	Bargaining Power (BP)	6
6	Industrial Linkage (IL)	6

Section D (Private HEI Performance)		
7	PHEI Effectiveness	7
8	PHEI Rating	9
9	PHEI Research Capacity	6
10	PHEI Financial	3

Result of Measurement Model

SmartPLS is a software application for designing structural equation models (SEM) on a graphical user interface (GUI). These models can be measured using the partial least squares (PLS) analysis method. The most recent version of SmartPLS is 4.0.8.5 (Ringle et. al., 2022).

In this paper, SmartPLS4 was preferred over other structural equation models for two reasons. First, SmartPLS4 contributes to a better understanding of marketing and management studies. Second, it supports complex models and second and third, SmartPLS4 has a comprehensive and intuitive graphical user interface that facilitates understanding and interpretation compared to SPSS or AMOS (Hair et al., 2019).

In view of this, two analytical procedures proposed by PLS-SEM are used in this study. In the first procedure, the measurement model including the original measurement was tested for factor loading, composite reliability (CR), and average extracted variance (AVE). If the average extracted variance (AVE) did not meet the minimum requirement of 0.50, factor loadings below 0.7 were dropped. Discriminant validity was then tested using the heterotrait-monotrait correlation ratio (HTMT).

Factor Loading, Composite Reliability and Average Variance Extracted

Factor loading shows how well an item represents the underlying construct. Typically, a factor loading above .70 is recommended (Vinzi et al, 2010). A number of indicators, such as average variance extracted (AVE), are commonly used to validate constructs. In statistics, AVE is a measure of the amount of variance captured by a construct relative to the amount of variance due to measurement error. On the other hand, composite reliability is also considered in this study. Composite reliability is a preferred alternative to Cronbach's alpha (see below) as a test of convergent validity in a reflective model. It may be preferred as a reliability measure because Cronbach's alpha may overestimate or underestimate scale reliability, mostly the latter. For this reason, composite reliability is preferred by researchers in PLS-based research. Compared to Cronbach's alpha, composite reliability can lead to higher estimates of true reliability. For this study, the first stage factor loading were as per Figure 1.

For Theory of Resource Capabilities, the elements were Courses Offered , Human Resource and Innovation. From table 2, For Courses Offered, no factor loading that has lower than 0.7 and therefore, all indicators are accepted (CR : 0.935, AVE : 0.642). For Human Resource the factor that less than 0.7 are HR6, HR7, HR8, HR9, HR10 (CR : 0.957, AVE : 0.599). Therefore, the factor will be deleted for the process. For Innovation, all items met the requirement (CR: 0.964, AVE : 0.672)

For Theory of Industrial Competitiveness, the elements were Bargaining Power, Competition and Industrial Linkage. For Bargaining Power , the Factor Loading less than 0.7 was BP6 (CR: 0.881, AVE : 0.553) Hence, this indicator will be deleted in next process. For Competition, the factor that less than 0.7 are CP1, CP2, CP5, CP7, CP9, CP10. (CR : 0.867, AVE : 0.400). Therefore, the factor will be deleted for the next process. For Industrial Linkage, the item that less than 0.7 were IL1 , IL6 (CR : 0.871, AVE : 0.534)

For Dependent Variable, the elements were Effectiveness, Rating, Research Capacity and Financial. The factor loading for Effectiveness all were acceptable (CR : 0.948, AVE: 0.722), Rating factor loading has 1 item that need to be deleted which are PR5 (CR: 0.929 AVE: 0.594), Research Capacity factor loading all satisfactory also (CR : 0.966, AVE: 0.824) and Financial factor loading meet the requirement (CR: 0.969, AVE : 0.913)

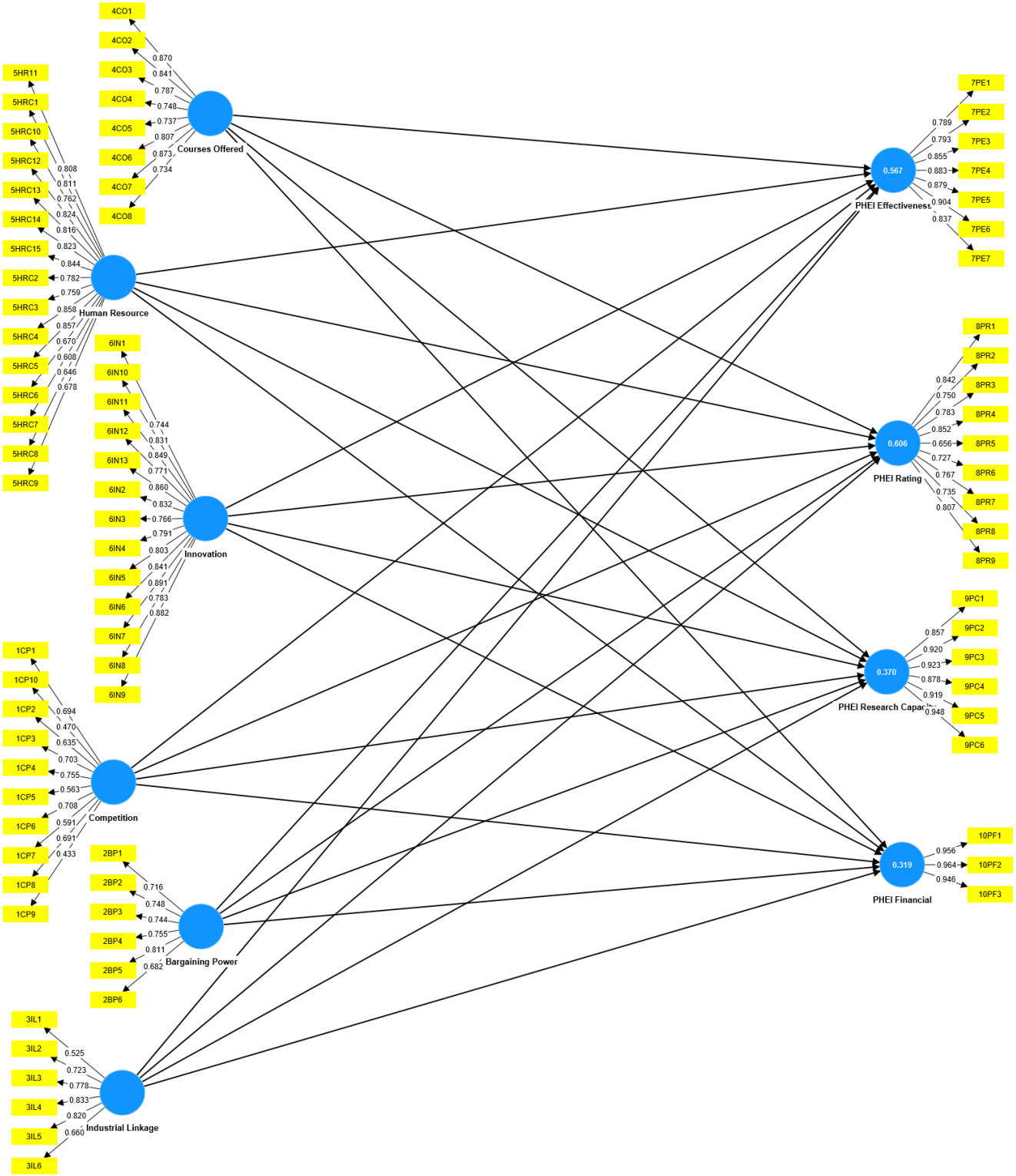

Figure 1 Measurement Model :Factor Loading Before Deleting Item
(Indicator; (CO)- Courses Offered , (HR)- Human Resource, (IN)- Innovation, (CP)-Competition, (BP)- Bargaining Power, (IL)- Industrial Linkage , (PE)- PHEI Effectiveness, (PR)-PHEI Rating, (PC) – PHEI Research Capacity, (PF) – PHEI Financial)

Table 2
Convergence Validity First Stage

Latent Variable (construct)	Indicator	Factor Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Independent Variable Resources Capabilities				
Courses Offered	**CO**		**0.935**	**0.642**
	CO1	0.870		
	CO2	0.842		
	CO3	0.788		
	CO4	0.749		
	CO5	0.736		
	CO6	0.805		
	CO7	0.872		
	CO8	0.735		
Human Resource	**HR**		**0.957**	**0.599**
	HR 1	0.811		
	HR 2	0.782		
	HR 3	0.759		
	HR 4	0.858		
	HR 5	0.857		
	HR 6	0.670		
	HR 7	0.608		
	HR 8	0.646		
	HR 9	0.678		
	HR 10	0.762		
	HR 11	0.808		
	HR 12	0.824		
	HR 13	0.816		
	HR 14	0.823		
	HR 15	0.844		
Innovation	**IN**		**0.964**	**0.672**
	IN1	0.744		
	IN2	0.832		
	IN3	0.766		
	IN4	0.791		
	IN5	0.803		
	IN6	0.842		
	IN7	0.891		
	IN8	0.783		
	IN9	0.882		
	IN10	0.831		
	IN11	0.849		
	IN12	0.771		
	IN13	0.860		
Industrial Competitiveness				

Bargaining Power	**BP**		**0.881**	**0.553**
	BP1	0.716		
	BP2	0.748		
	BP3	0.744		
	BP4	0.755		
	BP5	0.811		
	BP6	0.682		
Competition	**CP**		**0.867**	**0.400**
	CP1	0.694		
	CP2	0.635		
	CP3	0.703		
	CP4	0.755		
	CP5	0.563		
	CP6	0.708		
	CP7	0.591		
	CP8	0.691		
	CP9	0.433		
	CP10	0.470		
Industrial Linkage	**IL**		**0.871**	**0.534**
	IL1	0.525		
	IL2	0.723		
	IL3	0.778		
	IL4	0.833		
	IL5	0.820		
	IL6	0.660		
Dependent Variable PHEI Performance				
Effectiveness	**PE**		**0.948**	**0.722**
	PE1	0.789		
	PE2	0.793		
	PE3	0.855		
	PE4	0.883		
	PE5	0.879		
	PE6	0.904		
	PE7	0.837		
Rating	**PR**		**0.929**	**0.594**
	PR1	0.842		
	PR2	0.750		
	PR3	0.783		
	PR4	0.852		
	PR5	0.656		
	PR6	0.727		
	PR7	0.767		
	PR8	0.735		
	PR9	0.807		
Research Capacity	**PC**		**0.966**	**0.824**
	PC1	0.857		

	PC2	0.920		
	PC3	0.923		
	PC4	0.878		
	PC5	0.919		
	PC6	0.948		
Financial	**PF**		**0.969**	**0.913**
	PF1	0.956		
	PF2	0.964		
	PF3	0.946		

Evaluation of Convergence Validity After Deleted Item

In this study, a few items were deleted that were below 0.70 because this significantly improved composite reliability and average variance extracted (AVE). The rule is that the number of deleted items is excellent if it does not exceed 20 percent of the total number of items in the model (Hair et al., 2017). After deleting indicators that performed poorly (Anderson and Gerbing, 1988), the results of the measurement analyses yielded satisfactory statistics, as shown in figure 2.

From the Figure 2 Measurement model: Factor Loading after Deleting Items, the factor loading shows a significant result for all variables. The result from Figure 2 was transferred to Table 3. From Table 3, it can be seen that for independent variable 1, Theory of Resource Capabilities, the Courses Offered for CO1 to CO8 have good factor loading, ranging from the lowest value 0.75 (CO8) to the highest value 0.870 (CO1). For human resources, the lowest loading is HR3 at 0.792 and HR15 has the highest loading at 0.898. For innovation, the lowest loading is IN1 at 0.744 and IN7 has the highest loading at 0.891. In addition, the courses offered have a composite reliability (CR) of 0.935 and an average extracted variance (AVE) of 0.642. Human resources indicate Composite Reliability (CR) of 0.962 and average variance extracted (AVE) of 0.714, while innovation indicates composite reliability (CR) of 0.964 and average variance extracted (AVE) of 0.672.

For Independent Variable 2, related to Industrial Competitiveness, the items of Bargaining Power for BP1 to BP5 show good factor loading from the lowest value 0.729 (BP2) to the highest value 0.809 (BP5). For competition, the lowest loading is CP8 with 0.737 and CP3 is the highest loading with 0.795. For industrial linkage, the lowest value is IL2 with 0.771 and the highest value is IL5 with 0.853. For Bargaining Power, the Composite Reliability (CR) is 0.880 and the Average Extracted Variance (AVE) is 0.596. Competition indicates the composite reliability (CR) as 0.850 and the Average Extracted Variance (AVE) as 0.586, and industrial linkage indicates the Composite Reliability (CR) as 0.893 and the average extracted variance (AVE) as 0.676.

For the Dependent Variable, PHEI Performance, the PHEI Effectiveness items for PE1 to PE7 show good factor loading from the lowest value 0.787 (PE1) to the highest value 0.905 (PE6). For Rating, the lowest loading is PR6 with 0.730 and PR4 is the highest loading with 0.868. For Research Capacity, the lowest loading is PC1 with 0.858 and PC6 is the highest loading with 0.958. Finally, for Finance, the lowest loading is PF3 with 0.945 and PF2 is the highest loading with 0.954. In addition, Effectiveness indicates Composite Reliability (CR) with 0.948 and Average Variance Extracted (AVE) with 0.722. Rating indicates Composite Reliability (CR) with 0.929 and Average Variance Extracted (AVE) with 0.620 and Research Capacity indicates Composite Reliability (CR) with 0.966 and Average Variance Extracted (AVE) with 0.824.

Finally, Finance shows a composite reliability (CR) of 0.969 and an average extracted variance (AVE) of 0.913.

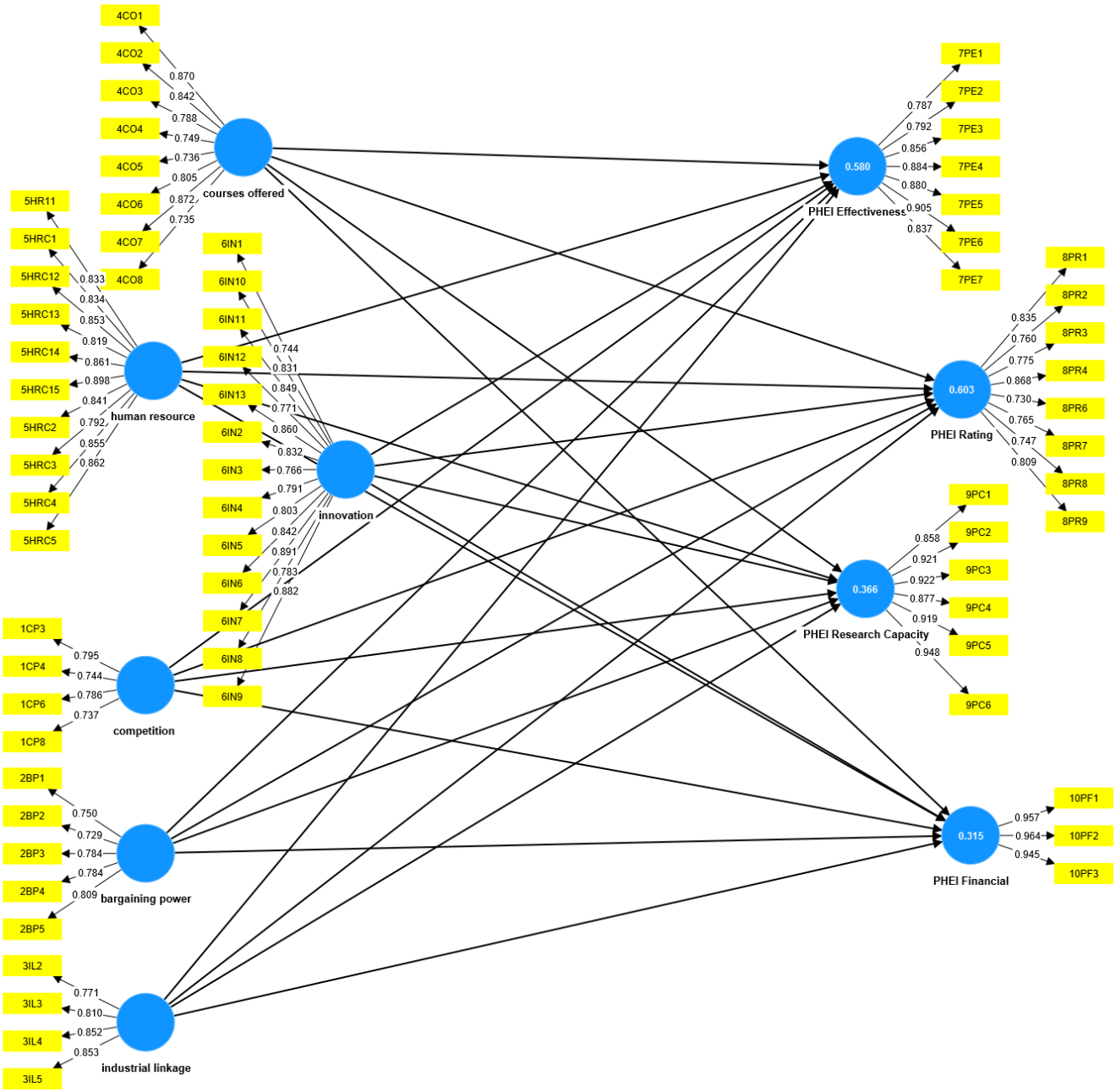

Figure 2 Measurement Model : Factor Loading After Deleting Item
(Indicator; (CO)- Courses Offered , (HR)- Human Resource, (IN)- Innovation, (CP)-Competition, (BP)- Bargaining Power, (IL)- Industrial Linkage, (PE)- PHEI Effectiveness, (PR)-PHEI Rating, (PC) – PHEI Research Capacity, (PF) – PHEI Financial)

Table 3
Convergence Validity Second Stage

Latent Variable (construct)	Indicator	Factor Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Independent Variable				
Resources Capabilities				
Courses Offered	**CO**		**0.935**	**0.642**
	CO1	0.870		
	CO2	0.842		
	CO3	0.788		
	CO4	0.749		
	CO5	0.736		
	CO6	0.805		
	CO7	0.872		
	CO8	0.735		
Human Resource	**HR**		**0.962**	**0.714**
	HR 1	0.834		
	HR 2	0.841		
	HR 3	0.792		
	HR 4	0.855		
	HR 5	0.862		
	HR 11	0.833		
	HR 12	0.853		
	HR 13	0.819		
	HR 14	0.861		
	HR 15	0.898		
Innovation	**IN**		**0.964**	**0.672**
	IN1	0.744		
	IN2	0.832		
	IN3	0.766		
	IN4	0.791		
	IN5	0.803		
	IN6	0.842		
	IN7	0.891		
	IN8	0.783		
	IN9	0.882		
	IN10	0.831		
	IN11	0.849		
	IN12	0.771		
	IN13	0.860		
Industrial Competitiveness				
Bargaining Power	**BP**		**0.880**	**0.596**
	BP1	0.750		
	BP2	0.729		
	BP3	0.784		
	BP4	0.784		

	BP5	0.809		
Competition	**CP**		**0.850**	**0.586**
	CP3	0.795		
	CP4	0.744		
	CP6	0.786		
	CP8	0.737		
Industrial Linkage	**IL**		**0.893**	**0.676**
	IL2	0.771		
	IL3	0.810		
	IL4	0.852		
	IL5	0.853		
Dependent Variable PHEI Performance				
Effectiveness	**PE**		**0.948**	**0.722**
	PE1	0.787		
	PE2	0.792		
	PE3	0.856		
	PE4	0.884		
	PE5	0.880		
	PE6	0.905		
	PE7	0.837		
Rating	**PR**		**0.929**	**0.620**
	PR1	0.835		
	PR2	0.760		
	PR3	0.775		
	PR4	0.868		
	PR6	0.730		
	PR7	0.765		
	PR8	0.747		
	PR9	0.809		
Research Capacity	**PC**		0.966	0.824
	PC1	0.858		
	PC2	0.921		
	PC3	0.922		
	PC4	0.877		
	PC5	0.919		
	PC6	0.948		
Financial	**PF**		0.969	0.913
	PF1	0.957		
	PF2	0.964		
	PF3	0.945		

(Indicator; (CO)- Courses Offered, (HR)- Human Resource, (IN)- Innovation, (CP)-Competition, (BP)- Bargaining Power, (IL)- Industrial Linkage , (PE)- PHEI Effectiveness, (PR)-PHEI Rating, (PC) – PHEI Research Capacity, (PF) – PHEI Financial)

Factor loading is the correlation between the item and the factor; a factor loading greater than 0.30 usually indicates a moderate correlation between the item and the factor (Hair et

al., 2017). Therefore, it can be concluded that each of the items discussed above has a strong correlation with the factors in this study.

This is confirmed by the composite reliability (CR) and average variance extraction (AVE) data. At this stage, the average variance extracted (AVE) must be greater than 0.5 to have significant convergent validity. The composite reliability value (CR) must be 0.7 or higher and the principal charge should be 0.7 (Hair et al., 2017). All loadings exceeding the recommended value of 0.708 (Hair et. al., 2017) are retained. In addition, all 10 constructs (from section B to D) meet the threshold/minimum cut-off values for CR and AVE, with all CRs greater than 0.7 and all AVEs greater than 0.5. This proves that the instruments studied are "meaningful" relative to the results of other related instruments.

Discriminant Validity

According to Henseler, Ringle, and Sarstedt (2015), the HTMT is more suitable for testing discriminant validity than the cross-loading and Fornell-Larcker criteria because it proves to be more reliable. Accordingly, discriminant validity between two constructs is established when the HTMT value is less than 0.90 (Sarstedt et.al ,2021). The reliability and validity results of this study are presented in Table 4. All reliability values of CR were above the recommended value of 0.7, while all convergent validity values were above 0.5 (Table 3). For discriminant validity, the values were below 0.90, indicating that discriminant validity was met (Sarstedt et al., 2021).

Heterotrait – Monotrait Ratio of Correlation (HTMT)

Table 4

Heterotrait- Monotrait Ratio of Correlation

	PE	**PF**	**PR**	**PC**	**BP**	**CP**	**CO**	**HR**	**IL**	**IN**
PE										
PF	0.503									
PR	0.852	0.486								
PC	0.635	0.583	0.71							
BP	0.533	0.382	0.651	0.38						
CP	0.725	0.47	0.757	0.493	0.728					
CO	0.553	0.361	0.677	0.513	0.669	0.786				
HR	0.73	0.456	0.662	0.53	0.426	0.705	0.61			
IL	0.474	0.311	0.565	0.465	0.761	0.633	0.639	0.486		
IN	0.738	0.564	0.744	0.575	0.519	0.747	0.691	0.867	0.529	

(Indicator ; (CO)- Courses Offered , (HR)- Human Resource, (IN)- Innovation, (CP)- Competition, (BP)- Bargaining Power, (IL)- Industrial Linkage , (PE)- PHEI Effectiveness, (PR)- PHEI Rating, (PC) – PHEI Research Capacity, (PF) – PHEI Financial)

Conclusion

This work is conducted to analyse the measurement model of the present study. The measurement model is important because it involves assessing the quality of constructs such as factor loading, reliability, and validity (convergent and discriminant validity). Only when the measurement model is solidified can the structural model be created. This is illustrated by the study of Kamis et.al (2020); Iqbal et.al (2021) where they stated that the measurement model should be strengthened before building the structural model, which will lead to more accurate hypothesis testing and other results.

In view of this, the researcher has shown all the factor loadings for the first phase . The factor loadings show several indicators that are below 0.7 and need to be deleted. Before deleting the factor loadings that were not met, all AVE were acceptable except for Competition, where AVE was 0.400. After the factor loadings were cleaned, the AVE were significant for all.

From this study, for the Resource Capabilities part, only 8 items should be used for Courses Offered, 10 items for Human Resources, and 13 items for Innovation. For the Industrial Competitiveness part, only 4 items should be used for the Competition, only 5 items for the Bargaining Power , and 4 items for the Industrial Linkage. For the dependent variable, all questions should be retained except the PHE Rating, which requires only 8 items. By using only these items, the Convergence Validity data are well acceptable and the HTMT rate is all below 0.900.

In conclusion, this study contributes to the methodology by helping to develop the questions in the survey, identifying the basic assumptions in the area of PHEI performance, demonstrating the validity of the items used, and determining how it can be applied to PHEI strategies in the future. The future study should test additional variables from Resource Capabilities Theory and Industrial Competitiveness Theory in order to provide a better measurement model.

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