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Developing a Valid Instrument to Measure How Personal Characteristic and Leader Behaviour Affect Team Performance

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Abstract: Kelab Memanah UiTM Pahang has appointed its team captain among the student as a coach since there is no new coach to be appointed due to unprecedented circumstances. Since the team need to maintain high team spirit, confidence and performance, the effectiveness of peer leader is still obscured. This study presents a tool for measuring personal characteristics, leader behaviour and performance. This study proposed a 34-item scale. There are 30 archers participated in this study. Using partial-least-square structural equation modelling (PLS-SEM), this study proposed a reliable tool to efficiently measure the constructs under study.

Keywords: Archery, Leader Behaviour, Personal Characteristic, Team Performance

1.   Introduction

UiTM archery team was facing with unique situation where since June 2014, this team has no coach in charge and left the team captain among the student to act as a coach. The team captain was responsible to lead and manage the team in every training and game. This gave opportunity for this study to explore how leadership influences to the team performance and also to explore the impact of personal characteristic and leader behaviour toward team performance.

2.   Instruments

The instrument originally has 56 items, which measure the dependent, and independent variables. The dependent variable in this study was team performance. Team performance is measured by five items relating to Productivity, Quality and Achievements. These items are adopted from the relationship between team and characteristic with team performance in Malaysia teams (Heng, 2006). Respondents were asked to indicate their belief about performance of the teams. A five-point Likert scale is used. (1= never, 2= seldom, 3= occasionally, 4= often, 5= always)

Independent variables consist of Personal characteristic that is measured by 12 items. For leader behaviour, the measure was adopted from Chelladurai and Saleh (1980) which have 39 items. This measurement has 5 dimensions, which consist of Training and Instruction, Autocratic Behaviour, Democratic Behaviour, Social Support, Positive Feedback.

3.   Preliminary Data Analysis

This study initiated its analysis by screening for monotones response and missing data. It was found that there was no monotones response from the returned questionnaires. It was also found that there was no missing data from the returned questionnaires.

Next, to make sure, that the data is approximately normal, we identified outliers using boxplot. Wind soring technique was later used to correct the outliers. Skewness and kurtosis statistics showed that the z-scores of the variables were within +/-1.96 suggesting approximate normal distribution.

4.   Confirmatory Factor Analysis

This study used WarpPLS version 4.0 outputs for confirmatory factor analysis (CFA) in order to confirm convergent and discriminant validity. The CFA also identifies the pattern of loadings of the measurement items on the latent constructs. The fit of this pre-specified model is then analysed by looking at the pattern of loadings of the measurement items.

According to Gefen and Straub (2005), loadings and cross-loadings that have *p*-values with more than 0.5 should be removed from analysis (as in table 1). In the first run, two items for Personal Characteristic (PC) and 20 items for Leadership Behaviour (LB) were removed due to low loadings. After the removal, all items have loading with sig. *p*-value that are more than 0.05 and considered valid items. Furthermore, the pattern of factor loadings has good convergent validity because the responds are associated together and this indicated that the questions are well understood in similar fashion (Kock, 2010).

The instrument used in this study has good discriminant validity. This is evidenced by each square root of the Average variance extracted (AVE) is larger than the correlation of the latent variables and the loading is group in the same column. This method is suggested by (Fornell & Larcker, 1981).

5.   Assessing the Validity and Reliability of the Measures

In PLS analysis, measurement models for the latent constructs is conducted. It includes assessing validity and reliability of the measures (guidelines provided in table 1). The majority of the construct were operationalised with multi-item measures and a Likert's five-point scale.

Further analysis was conducted for an individual construct using the WarpPLS version 4.0. Table 2 provides the summary of individual item loadings for Personal Characteristic. The loadings are ranging from 0.69 to .82 which is more than sufficient (Hair, Black, Babin, Anderson, & Tatham, 2010; Kock, 2013). The composite reliability (CR) is .898 which is desirable (Peter, 1979), the Cronbach's alpha is 0.87 and Average Variance Extracted (AVE) is 0.47. The AVE is slightly below the desired value of 0.5, however, according to Fornell and Larcker (1981), an AVE with less than 0.5 but the CR is above 0.6 the convergent validity of the construct is still considered adequate. All indicators are well above desired value which indicates that the measures for Personal Characteristic are valid and reliable.

The individual item loadings for Leader Behaviour is summarised in table 3. The loadings are ranging from 0.65 to 0.94. The CR for this measure is 0.931 and the Cronbach's alpha is 0.920. Both indicators are considered very high. However, the AVE is 0.420 which is quite low. Both Barclay, Thompson, and Higgins (1995) and Urbach and Ahlemann (2010) mentioned that the value of AVE should be above 0.50. However, according to Fornell and Larcker (1981), if the value of AVE is less than 0.50 but having CR that is higher than 0.6, the convergent reliability for the construct is acceptable where in this case the CR is well above the required value (0.931).

Table 1. Guidelines in Assessing Convergent and Discriminant Validity

Assessment	Indicators	Desired value	Studies
Convergent validity	Individual item standardized loading on parent factor	Above 0.50	Nunnally (1978) Hair et al. (2010)
	Loading with sig. *p*-value	P<.05	Gefen and Straub (2005)
	Composite reliability (CR)	Above 0.80	Peter (1979)
		Above 0.70	Fornell and Larcker (1981) Nunnally and Bernstein (1994) Hair et al. (2010)
	Average variance extracted (AVE)	Above 0.50	Barclay et al. (1995) Hair et al. (2010) Urbach and Ahlemann (2010)
		Less than 0.50	Bagozzi (1988)
		AVE < 0.5, but CR > 0.6, the convergent validity of the construct is still adequate	Fornell and Larcker (1981)
		Less than 0.40 (should be eliminated from the model)	Bagozzi (1988)
Discriminant validity	Square-root of AVE	More than the correlations of the latent variables	Hair et al. (2010)
	Variance inflation factor (VIF)	< 10	Hair et al. (2010)
		< 5 < 3.3 (ideal)	Kock and Lynn (2012)

Table 2. Construct – Personal Characteristic

Construct	Mean	SD	Loading	CR	Alpha	AVE
B1	4.17	.83	0.82	0.90	0.87	0.47
B2	4.27	.64	0.68			
B3	4.03	.76	0.76			
B4	3.67	.92	0.82			
B5	4.13	.63	0.73			
B6	4.13	.73	0.75			
B7	3.70	1.09	0.72			
B8	3.93	.74	0.80			
B9	3.53	.90	0.82			
B11	3.77	.97	0.69			

* B –Behaviour

Table 3. Construct – Leadership Behaviour (Training Behaviours' items)

Construct	Mean	SD	Loading	CR	Alpha	AVE
CTB1	3.73	.52	0.83	0.93	0.92	0.42
CTB2	4.10	.99	0.75			
CTB3	3.87	.82	0.68			
CTB4	3.83	.87	0.72			
CTB5	3.70	.75	0.68			
CTB7	3.77	.86	0.66			
CTB8	3.80	.99	0.65			
CTB12	3.53	.82	0.75			
CSS1	3.43	1.10	0.78			
CSS2	3.43	.935	0.79			
CSS3	3.50	.82	0.84			
CSS4	3.47	1.07	0.88			
CSS5	3.07	1.23	0.86			
CSS6	3.57	1.16	0.84			
CRB1	3.40	.85	0.79			
CRB2	3.73	.64	0.65			
CRB3	3.60	.93	0.78			
CRB4	3.97	.76	0.81			
CRB5	3.57	.94	0.94			

* CTB – Coach Training Behaviour, CSS-Coach Social Support, Coach Rewarding Behaviour

As illustrate in table 4, the Team Performance (TP) was measured using five items. The loadings are ranging from 0.81 to 0.96. The CR for this measure is 0.818, Cronbach's alpha is 0.721 and AVE is 0.474.All indicators are considered very high. However, the AVE value of 0.474 is raising concern. Nevertheless, Fornell and Larcker (1981), suggest that an AVE which has value of less than 0.50 but having CR that is higher than 0.6 is still adequate and the measures are considered valid and reliable.

Table 4. Construct – Team Performance

CONSTRUCT	mean	SD	Loading	CR	Alpha	AVE
D1	4.07	.69	0.96	0.82	0.72	0.47
D2	4.33	.66	0.811			
D3	4.03	.81	0.953			
D4	3.90	.84	0.874			
D5	4.20	.92	0.926			

* D –Team Performance

In summary, table 5 indicated that the constructs' items are correlated strongly with other items in the same constructs. This is evidenced by almost all the items loaded at desired value of above 0.50. Convergent validity was evidenced further, by high CR and acceptable AVE threshold.

Table 5. Reliability and Validity of Variable

Construct	Number of items	Alpha	Factor loading	CR	AVE
Personal Characteristic	10	0.87	(0.69-0.82)	0.898	0.471
Leader Behaviour	19	0.92	(0.65-0.94)	0.931	0.420
Team Performance	5	0.72	(0.81-0.96)	0.818	0.474

The discriminant validity is assessed by looking at correlations among latent variables and square-root of AVE (Kock, 2013) and the variance inflation factor (VIF) associate it with other construct and by looking at degree of multicollinearity among the latent variables to ensure that no latent variables that measure the same thing. Table 6 shows that the instrument used has a good discriminant validity because each latent variable, the square root of the AVE is larger than any correlations of latent variables, in the same column as suggested by (Fornell & Larcker, 1981)

Table 6. Correlations and AVE

Variable	Personal Characteristic	Leader Behaviour	Team Performance
PC	**0.844**		
LB	0.775*	**0.485**	
TP	0.316*	0.326*	**0.688**

Square roots of AVE's shown on diagonal; * indicates $p < 0.001$; **indicates $p < 0.05$; *** indicates $p < 0.5$

6.   Conclusion

This study presented a tool that can efficiently measure personal characteristic, leadership behaviour and team performance. This study provides the tangible measurement items; to make sure the items in a construct is valid and reliable. Further research should be done to investigate the effect of personal characteristic and leader behaviour on team performance.

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