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The Construct Validity of Health and Safety Executive "HSE" Tools for Measuring an Organizational Performance: Evidence from the aviation industry in Yemen

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ABSTRACT

This study focus's on the psychometric properties of the Health safety and executive "HSE" construct validity, which used as a performance indicator for the organizational performance research. This tool integrates seven factors- demand, control, managers' support, peer support, relationship, role and change using English version of the instrument developed by the HSE named "Management Standard". The HSE Management Standard construction validity tested and analyzed using AMOS structural equation model version 18. The results found support for the fact that HSE construct factor can be measured by the seven theorized factors. The findings also showed an acceptable internal consistency reliability of the overall and the seven specific subclasses of HSE factor. Based on the results, it can be concluded that the HSE model measurement tool can be a useful and appropriate tool in as an indicator of the organizational performance construct.

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INTRODUCTION

The performance of an airline organization is an interesting research setting for study. However, it is worthy of note to indicate that most studies on organizational performance were conducted in various countries like Iran, US, Canada and Malaysia in the fields of health care, airlines, banks etc. Nonetheless, to date, such study is absent in Middle Eastern countries like Yemen, particularly, in the airline industry. Hence, the present study contributes to the existing literature by tackling the issue of organizational performance of a national carrier in Yemen.

In the present study also, organizational performance is measured slightly different from previous researchers; instead of using objective, financial indicators the present study considers the use of health and safety executive (HSE) tool that assesses employees' perceptions of quality of work life and job stress. The HSE tool is a psychometrically sound measure of organizational performance against the HSE management standards (Brookes *et al*., 2013). The Health and Safety Executive (HSE) tool defines six management standards representing aspects of work that, if poorly managed, are associated with lower levels of employee health and productivity and increased sickness absence. The HSE indicator tool aims to measure organizations' performance in managing the primary stressors identified by the HSE management standards (Brookes *et al*., 2013). The Health and Safety Executive (HSE) describes job stress as an adverse reaction to excessive or extreme pressures or demands that may be placed upon individuals. Although there are different frameworks and theories to explain work related stress, it can be seen as a psychological state that reflects the relationship between individuals and their work environment (Brookes *et al*., 2013). The tool has been used to measure work-related stress across different occupational groups, with a clear relationship between the HSE tool and alternative measures of well-being (Brookes *et al*., 2013). Even though the validity and psychometric properties of the HSE Indicator Tool has been confirmed to measure employee job stress, (Edwards, Webster, Van Laar, & Easton, 2008) stressed the need to conduct more research to explore the use of the tool in the design of interventions to reduce stress, and its use in different contexts with different cultural and gender groups. In using the HSE Indicator tool to measure performance, the present study contributes further to the literature on providing a validity of using this tools from different envirunments.

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Objectives:

The objectives of the present study were paired: the first one is to assess the internal consistency reliability of the organizational performance factors and the overall score, and the second one is to assess the construct validity of organizational performance using confirmatory factor analysis procedures. The construct validity of the factor was studied in terms of convergent and discriminant validity. The values of variance extracted (VE), construct or composite reliability (CR), and standardized factor loadings were used to measure the Convergent validity (Hair *et al*. 2006). To validate the evidence of discriminant validity, the values of average variance extracted (AVE) between dimensions were compared to the squared multiple correlations of the two (Hair *et al*., 2006). The items and dimensions of organizational performance were adapted based on (HSE, 2009) that measure seven factors of the construct: Demands, Control, Managers Support, Peer- Support, Relationships, Role, Change.

MATERIALS AND METHODS

This research design adopted quantitative cross-sectional survey approach (that is the collection of data at one point in time). Structural equation modeling (SEM) and regression analysis were the statistical tool used in measuring the nature of the relationship between constructs. The cross-sectional research approach was chosen because the research used data from only one source, the Yemen Airways (the only National Carrier in the country under study). This limitation her is the ability to gather data from other sources. This research unit of analysis includes the totality of Yemen Airways' managerial personnel in finance and accounting department, operations department, commercial department, maintenance department. The researcher believes that managerial staff in any of these departments is capable of assessing Yemen airways' business performance. The duties of the staff in mentioned departments are reasonably linked to Yemen airways' performance. This research excluded the manager-level because they may be biased in information dissemination as they form part of the management of Yemen airways strategy. Such biased response has the capacity of derailing the outcome of this research. The targeted population of this particular study is Yemen Airways headquartered in Sana'a along with its staff all the departments comprises four thousand (4,000) personnel.

This study adopt the systematic sampling technique. Systematic sampling technique promotes quick determination of the sample size in research writing. To avoid the problem of poor and incomplete completion of the research questionnaire being administered, the Human Resources Department support staff to the researcher suggested that staff for the questionnaire answering should be chosen from the staff attendance list which is Information Technology driven by the use of the thumb printing system. The formula for arriving at the sampling of respondent for the research is:

k^{th} =N/n= 4000/351=11.3 =11 approx.

where: k^{th} = he interval of respondents to be chosen;

N = Population of the study;

n = Required sample size

The researcher chose 3 as the random between 1 and 11. Applying the arithmetic progression technique, the common difference between 11. So, after 3, the next in the sequence is 14, followed by 25, and 36 in that order till he reached the 351 respondents.

RESULTS AND DISCUSSIONS

The study made using Amos-based structural equation modeling (SEM) of the SPSS (Statistical Package for Social Science) 18.0 edition to analyze the data collected for this research for the purpose of testing the hypotheses. The validity of structural equation modelling as an instrument, analyzing data, Kline (2010) and Hair *et al*. (2006), stated that SEM analysis and validity of the constructs are measured in two ways:

1. The Discriminant validity test measures the real distinctness of a construct when compared with other constructs. It adds that the root of the Average Variance Extracted (AVE) for one construct is bigger than the two constructs put together and that the correlations between their factors should not be more than 0.85.
2. The Convergence validity test depicts the similarity in the extent of change between the specific constructs and is quantified by:

a) The factor loading value of 0.5 or higher and computed mean variance of 0.5 or;

b) The Average Variance Extracted (AVE) is computed by dividing the sum square of the standardized factor loading by the factor loading number.

c) The Construct reliability (CR) should at least be 0.6 or greater.

Reliability analysis was computed in this study for the purpose of determining the internal consistency of the scales. The importance of the reliability analysis measurement in this study, is to assure that the unit scale measures the same build, are centrally interrelated, and the degree of their measurement is error-free (Hair, Black, Babin, Anderson, & Tatham, 2006). The Cronbach's alpha was used in evaluating the reliability of the questionnaire used in this research and the acceptable scale measure remained greater than 0.70. a copy of the questionnaire is attached.

Standardized Loadings of the Model's Items:

An The constructs assessment has been done

successfully through the CFA model. The assessment results showed that the standardized loadings of the model's items and ten of these items (DEMN1, DEMN5, DEMN6, DEMN7, CONT1, CONT4, CONT6, MGSP5, RELT4 and ROLE 4) were lower than the factor loadings standard cut-off 0.5.

Therefore, these items were deleted from their relative constructs. The revised model with remaining (25 items) was once more tested to ensure whether the remaining factor structure is sufficient with the standard or not. Based on the assessment result, the second standardized factor loading for all items and constructs was higher than the standard 0.5, "ranged from 0.65 to 0.916". Table 1, demonstrates the deleted items from the assessed model and also showed the recalculated factor loadings for the remaining items.

Goodness of Fit Indices:

The results of the second measurement model for organizational performance provided an enough fit of the data with the remaining 25 items. The chi-square assessment show significant results "(χ2= 449.182, df =254, p=.000)". As long as the GFI results are "0.865, AGFI=0.827, CFI=0.953, TLI=0.944, IFI=0.953 and RMSEA =0.060". Nevertheless, the overall assessment results for the construct of the revised CFA model, indicated that the measurement model could be improved by looking at the standardized residual covariance of each item and modification indices (M.I). The results show that the error of 'DEMN 8' had high M.I value of covariance with the other items' errors, referring to between-construct error covariance.

Consequently, the decision here in this case to "delete this item "high M.I value of covariance with the other items' errors" from the second CFA model. After iteratively correlating these errors, results indicate that this model fits the data sufficiently. The GFI results was 0.876 which is slightly lower than the standard cut-off 0.9 as recommended by Hoyle (1995), but still above 0.85 standard. Normally, GFI is more heavily impacted by a relatively small sample size (below 200), and as Byrne (1998) points out, "the CFI is more appropriate when the sample size is small".

Table 1: Organizational Performance "Discarded Items Due to Insufficient Factor Loadings in CFA Model"

Factor	Item	First Factor Loading	Item Del	2nd Factor Loading
Demands (DEMN)	DEMN1	0.283	Deleted	
	DEMN2	0.869		0.87
	DEMN3	0.893		0.9
	DEMN4	0.843		0.86
	DEMN5	0.35	Deleted	
	DEMN6	0.346	Deleted	
	DEMN7	0.284	Deleted	
	DEMN8	0.678		0.65
Control (CONT)	CONT1	0.352	Deleted	
	CONT2	0.84		0.84
	CONT3	0.87		0.87
	CONT4	0.328	Deleted	
	CONT5	0.91		0.92
	CONT6	0.301	Deleted	
Managers Support (MGSP)	MGSP1	0.841		0.85
	MGSP2	0.869		0.87
	MGSP3	0.821		0.82
	MGSP4	0.809		0.81
	MGSP5	0.308	Deleted	
Peer Support (PESP)	PESP1	0.84		0.84
	PESP2	0.874		0.87
	PESP3	0.845		0.85
	PESP4	0.826		0.83
Relationships (RELT)	RELT1	0.858		0.86
	RELT2	0.888		0.89
	RELT3	0.875		0.88
	RELT4	0.317	Deleted	
Role (ROLE)	ROLE1	0.812		0.81
	ROLE2	0.864		0.87
	ROLE3	0.886		0.88
	ROLE4	0.454	Deleted	
	ROLE5	0.843		0.85
Change (CHNG)	CHNG1	0.864		0.87
	CHNG2	0.891		0.89
	CHNG3	0.87		0.87

Furthermore, the obtained value of GFI was adequate, as recommended by (Gefen, 2000), "GFI values must lie "between 0.85 and 0.9". After modifying the degrees of freedom relative to the number of variables, the modified GFI (AGFI) value was 0.838, which was above the standard cut-off

point 0.80 as recommended by Chau and Hu (2001). The results of CFA showed that the model predicts 83% of the variances and covariance in the survey data. Based on the CFI, TLI, and IFI indices with values more than the standard cut-off value 0.9 the model had good fit of data.

In addition, the value of root-mean-square error of approximation (RMSEA) was 0.056, which was within the perfect fit range as recommended by Hair, *et al*., (2006) and Ho (2006). Furthermore, the relative CMIN/df (1.677) was lower than 5, which showed the good fit of the model. Given that, as demonstrated in figure 4.4, the modified model for Organizational Performance fits the data sufficiently, and no more modifications are required.

Organizational Performance, Reliability and Convergent Validity:

The uni-dimensionality assessments of the constructs was achieved successfully, reliability and validity of each construct was assessed. "Reliability is assessed using Cronbach's alpha, construct reliability (CR) and average variance extracted (AVE), while for validity using construct, including convergent and discriminant".

The number of deleted items is (11 deleted items), which is quite high compared to the total number of items in the organizational performance constructs (35 items), Nevertheless, the deletion does not significantly change the content of the constructs as they are conceptualized. As shown in Table 4.21, the remaining items have high factor loadings ranging "from 0.809 to 0.916" demonstrating that the remaining factors has been preserved by these indicators.

dditionally, as demonstrated in Table 2, the AVE values were higher than the standard cut-off 0.5, ranging "from 0.698 to 0.769". The composite reliability (CR) value goes higher than the recommended value of 0.6 for all constructs as recommended by Bagozzi and Yi (1988), ranged "from 0.902 to 0.914". The Cronbach's Alpha values, describe the degree to which a measure is error-free, ranged "from 0.902 to 0.914", which were above the threshold of 0.7 as recommended by Nunnally and Bernstein (1994). Therefore, the values of Cronbach's Alpha for all constructs was considered as sufficiently error-free.

Table 2: Organizational Performance CFA Model "Results of Cronbach Alpha and Convergent Validity"

Factors	Items	Internal Reliability Cronbach Alpha	Convergent validity		
			Final FL	(AVE)a	(CR)b
Demands (DEMN)	DEMN1	0.908	0.283[c]	0.769	0.909
	DEMN2		0.869		
	DEMN3		0.901		
	DEMN4		0.861		
	DEMN5		0.35[c]		
	DEMN6		0.346[c]		
	DEMN7		0.284[c]		
	DEMN8		0.65[d]		
Control (CONT)	CONT1	0.908	0.352[c]	0.768	0.909
	CONT2		0.841		
	CONT3		0.871		
	CONT4		0.328[c]		
	CONT5		0.916		
	CONT6		0.301[c]		
Managers Support (MGSP)	MGSP1	0.902	0.847	0.698	0.902
	MGSP2		0.866		
	MGSP3		0.819		
	MGSP4		0.809		
	MGSP5		0.308[c]		
Peer Support (PESP)	PESP1	0.909	0.84	0.716	0.91
	PESP2		0.874		
	PESP3		0.845		
	PESP4		0.826		
Relationships (RELT)	RELT1	0.907	0.858	0.765	0.907
	RELT2		0.891		
	RELT3		0.875		
	RELT4		0.317[c]		
Role (ROLE)	ROLE1	0.914	0.814	0.727	0.914
	ROLE2		0.868		
	ROLE3		0.877		
	ROLE4		0.454[c]		
	ROLE5		0.851		
Change (CHNG)	CHNG1	0.907	0.864	0.766	0.907
	CHNG2		0.891		
	CHNG3		0.87		

[a]: Average Variance Extracted = "(sum of the square of the factor loadings) /[(sum of the square of the factor loadings) + (sum of the error variances)]".

[b]: Composite reliability = "(square of the sum of the factor loadings)/[(square of the sum of the factor loadings) + (square of the sum of the

error variances)]".
[c]: denotes for "deleted item due to insufficient factor loading below the standard cut-off 0.5"
[d]: denotes for "deleted item due to high M.I. Value of error covariance (above 15)"

Discriminant validity:

The discriminant validity for the construct was examined to assess "how truly construct is distinct from other constructs". In the case of discriminant validity, "the correlations between factors in the measurement model do not exceed 0.85" as recommended by Kline (2010). The correlations between the constructs in organizational performance are shown in Table 3.

Table 3: Organizational Performance "The Constructs Correlations"

Organizational Performance Construct	MGSP	DEMN	ROLE	CHNG	CONT	RELT	PESP
Managers Support (MGSP	1						
Demands (DEMN)	0.300	1					
Role (ROLE)	0.440	0.134	1				
Change (CHNG)	0.580	0.260	0.459	1			
Control (CONT)	0.510	0.347	0.610	0.565	1		
Relationships (RELT)	0.191	0.547	0.135	0.290	0.212	1	
Peer Support (PESP)	0.638	0.317	0.422	0.638	0.502	0.183	1

As shown in Table 3, the inter-correlations between the seven sub- constructs ranged "from 0.134 to 0.638", which were lower than the threshold 0.85.

The constructs validity has been calculated and confirmed based on the formula "comparisons of the correlations between constructs and square root of the average variance extracted for a construct", which is recommended by (Fornell & Larcker, 1981). Table 4, demonstrate the organizational performance "discriminant validity of the modified measurement model".

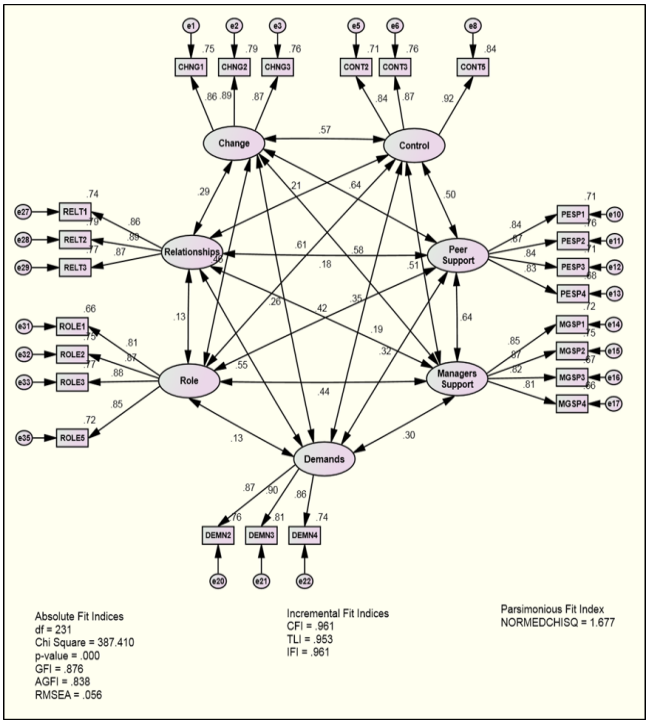
Table 4: Organizational Performance "Discriminant validity of Modified Measurement Model"

Organizational Performance Construct	MGSP	DEMN	ROLE	CHNG	CONT	RELT	PESP
Managers Support (MGSP	**0.836**						
Demands (DEMN)	0.090	**0.877**					
Role (ROLE)	0.194	0.018	**0.853**				
Change (CHNG)	0.336	0.068	0.211	**0.875**			
Control (CONT)	0.260	0.120	0.372	0.319	**0.877**		
Relationships (RELT)	0.036	0.299	0.018	0.084	0.045	**0.875**	
Peer Support (PESP)	0.407	0.100	0.178	0.407	0.252	0.033	**0.846**

Note: "Diagonals represent "the square root of the average variance extracted while the other entries represent the square correlations".

As shown in Table 4, "the square correlations are lower than the square root of the average variance extracted by the indicators", which refer that demonstrating a good discriminant validity between these factors (Kline 2010).

Consequently, based on the results of examining the goodness of data fit, convergent validity and discriminant validity of the modified measurement model, it can be concluded that the final modified measurement model for assessing the constructs and their relative items in the construct was reliable and valid. The following figure, portrays the modified and final measurement model with standardized factor loadings for the remaining 24 items.



Conclusion:

The results show that there are ten items were deleted because of the low factor loading 0.5 and the remaining items ranged from 0.65 to 0.916. The second measurement model for the HSE construct provided adequate fit of the data with reminder 25 items. The overall results of the CFA indicated that the measurement model could be improved by looking at the standardized residual covariance of each item and modification indices.

The results show that all observed variables consistently represent the latent construct and values, variance extracted for each factor were above the acceptable level, lending support for convergent validity of the adopted instrument in measuring organizational performance.

The construct validity results were also attributed to the nature of the organizational performance; because the tool factors of HSE management standard are more related to the daily work of employees which look at the discretionary behavior of employees. As long as the employees are working some time beyond what is stated in their job description in order to fulfil the needs of high management order some time and some time because of the work and needs.

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