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An Examination of the Validity and Reliability of the Organizational Structure Scale in the Malaysian Context: Preliminary Results

Yusliza Mohd. Yusoff
T. Ramayah
Hazman Shah Abdullah

ABSTRACT

Organizational structure provides the basic foundation within which an organization functions. This study focuses on the two most important aspects of structure – centralization and formalization – to keep the study simple while capturing the essence of how organizations are structured. The purpose of this study is to examine the goodness of measure (validity and reliability) of the organizational structure measure developed by Hage and Aiken (1967, 1970) who posited a five dimensions instrument. The data is drawn from a larger-scale study during the preliminary phase of the data collection process. The data was collected using a structured questionnaire which was sent through mail to selected companies in the manufacturing and service sector in Malaysia. A total of 90 questionnaires were returned over a period of 12-week. The results were validated through the use of factor analysis, correlation, and reliability analysis. The factor structure of the factor analysis substantially reproduced the same dimensions as developed by Hage and Aiken. Furthermore, reliability testing showed values ranging from 0.61 to 0.87 for all dimensions and thus the instrument can be considered to sufficiently reliable. In conclusion, the analysis shows that the instrument is valid (content, construct, convergent and discriminant) as well as reliable. Implications regarding the value of conducting validity and reliability test for practitioners and researchers are discussed.

Keywords: *Organizational structure, formalization, centralization, validity, reliability*

Introduction

One of the most fundamental and problematic issue facing organizations and managers is designing a structure that is capable of meeting the needs of modern businesses (Black & Edwards, 2000; Miles, Snow, Matthews & Coleman, 1997). In fact, organizational structure change has been one of the most topical issues in management and organizational studies over the last two decades (see for example Black & Edwards, 2000; Hinkin & Tracey, 1999; Stebbins, Shani, Moon, & Bowles, 1998).

Much research efforts and attention have been invested in studying organizational structure in relation to many pertinent issues. Past organizational structure studies have concentrated mostly on size (Miller & Droge, 1986), technology (Dembla, Palvia & Krishnan, 2007; Ghani, Jayabalan & Sugumar, 2002; Gupta, Chen & Chiang, 1997; Hage & Aiken, 1969; Ibrahim & Juhary, 2005; Kim & Lee, 2006; Miller & Droge, 1986), environmental uncertainty (Lysonski, Levas & Lavenka, 1995; Miller & Droge, 1986), organizational climate (Ibrahim & Juhary, 2005; Aizzat, Ramayah & Beng, 2005), performance (Meijaard, Brand & Mosselman, 2005; Ogbonna & Harris, 2003), and satisfaction (Dewar & Werbel, 1979; Ibrahim & Juhary, 2005). However, not much has been done on validation of the measurement used (with the exception of Dewar, Whetten & Boje, 1980).

The measurement of organizational structure developed by Hage and Aiken (1967, 1970) has been widely cited, used, and has had a major influence in shaping our contemporary understanding of organization (see Aiken & Hage, 1968; Dewar et al., 1980; Hage & Aiken, 1969; Ibrahim & Juhary, 2005; Schminke, Cropanzano & Rupp, 2002; Tata & Prasad, 2004). Following the caution by many researchers that all instruments must be continuously tested for goodness especially if it originated from different settings, as in this case, the purpose of this paper is to assess the validity (content, construct, convergent, and discriminant) and reliability of Hage and Aiken's (1967, 1970) measures of centralization and formalization and, thereby, add confidence to the operationalisation of this construct. The following section presents the review of the literature on organizational structure followed by the methodology employed. The findings are discussed, summarized and conclusions noted.

Literature Review of Organizational Structure

Organizational strategists have suggested firms that remain stable and unchanging cannot survive long due to the acceleration in turbulence in almost all operating environments (Marshak, 2004; Yasai-Ardekani, 1989). As organizations respond to environmental pressures, it appeared that the structure of the organization can take on many forms. Organizational structure is the way

responsibility and power is allocated, and work procedures are carried out, among organizational members (Dewar & Werbel, 1979; Ruekert, Walker & Roering, 1985). Ghani et al. (2002) defined organizational structure as the formal allocation of work roles and administrative mechanism to control and integrate work activities. According to them, if the organization's design is not appropriate for the work to be performed, behavioral problems can easily set in and the effectiveness of the decision-making system can be seriously undermined.

The classification of structure varies among different researchers. A typology that subsumes most classifications and that has become popular is the mechanistic – organic structure (Burns & Stalker, 1961) also referred to as bureaucratic – adhocratic (Mintzberg, 1979; Parthasarthy & Sethi, 1992). Instead of organic and mechanistic structure, Dalton, Todor, Spendolini, Fielding, and Porter (1980) classified structure as either centralized or decentralized, indicating the dispersion of decision-making authority throughout the organization. Besides that, Miller and Droge (1986) highlighted three key dimensions of organizational structure: centralization, specialization, and formalization. These dimensions are still frequently used in organizational design research (for example; Damanpour & Gopalakrishnan, 1998; Dastmalchian & Blyton, 1992; Gupta et al., 1997; Hage & Aiken, 1967; Ibrahim & Juhary, 2005).

Damanpour (1991) provides a rather thorough list of multiple dimensions of structure, through an extensive review of the organizational innovation literature. He documented that researchers have used specialization, functional differentiation, professionalism, formalization, centralization, managerial attitude toward change, managerial tenure, technical knowledge resources, administrative intensity, slack resources, external communication, internal communication, and vertical differentiation, in their probe into the relationships between organizational determinants and innovation. Meanwhile, Parthasarthy and Sethi (1992) stated that organizational structures have been classified based upon the division of task (horizontal differentiation), the distribution of decision-making authority (vertical differentiation), and the level of integration used. Vickery, Droge, and Germain (1999) classified organizational structure into four facets; formal control, decentralization, layers, and spans of control.

A large number of variables have been studied in terms of their outcomes of the organizational structure. For instance, Dembla et al. (2007) used a structural equation modeling technique (LISREL 8.51) to analyze data from 211 organizations to assess the degree of centralization and formalization on the degree of adoption of web-enabled transaction processing in small businesses. They found that adoption of web-enabled transaction processing systems is positively influenced by centralization and formalization.

Kim and Lee (2006) examined the impact of organizational context and information technology on employee knowledge-sharing capabilities. They hypothesized that the degree of centralization is negatively associated with

employee knowledge-sharing capabilities. The ordinary least squares multiple-regression analysis was used to analyze data collected from 322 employees in five public-sector and five private-sector organizations in South Korea. Result showed that centralization was found to significantly affect employee knowledge-sharing capabilities in the organization.

Azzat et al. (2005) studied organizational structure and organizational climate as potential predictors of job stress in a sample of 151 paid-dealers in nine stock broking companies in Malaysia. They utilized hierarchical regression to assess the relationship between formalization, centralization, and organizational climate on the job stress. They hypothesized a positive relationship between formalization and centralization on job stress. Results showed that formalization and centralization having significant and positive relationships with job stress.

Ibrahim and Ali (2005) conducted a study on the effects of the interaction of technology, structure, and organizational climate on job satisfaction in Malaysia. Data was collected using a simple random sampling among 345 employees working in power plants. They used hierarchical multiple regression analysis to test the interaction effects of each of the dimensions of technology, structure, and organizational climate. They found that specialization, formalization, and centralization had significant effect on job satisfaction.

Although formalization and centralization are not the only structural factors affecting organization design, they may often be the vital ones and are the two fundamental elements in control and coordination (Hage, 1965). Thus, the structural dimensions used by Hage and Aiken (1967, 1970) to encapsulate the measurement of organizational structure were incorporated in this study. Hage and Aiken's structural dimensions are formalization and centralization. These dimensions were deemed to be sufficient to measure the organizational structure of the organizations in this study.

Centralization

According to Liao (2007), centralization refers "to the degree to which the formal authority to make discretionary choices is concentrated in an individual, unit, or level (usually high in the organization), thus permitting employees (usually low in organization) minimum input into their work". Olson, Slater, and Hult (2005), in their definition of centralization, refer to whether decision authority is closely held by top managers or is delegated to middle and lower level managers. Hage and Aiken (1967; p. 67) defined centralization as "how power is distributed among social position". Hage and Aiken (1967) measured two parts, organizational centralization which they referred to as participation in decision making and hierarchy of authority. On the one hand, participation in decision making is the degree of distribution of organizational decision-making processes in regard to policy decisions. It describes the extent to which employees have

the authorities for policy decisions and the power to make decisions about hiring of personnel, the promotion of personnel, the adoption of new policies, and the institution of new services. On the other hand, authority hierarchy is the degree of concentration of decision making in regard to task performance. It describes the extent to which authority over day-to-day task decisions is concentrated in a few hands, with employees having to refer to superiors when making decisions about their jobs. Centralized organizational structures have low participation in decision making and high authority hierarchy (Tata & Prasad, 2004).

Formalization

Formalization refers to the degree to which jobs within the organization are standardized (Liao, 2007). He argued that in highly formalized job, the job incumbent has a minimum amount of discretion over what is to be done, when it is to be done, and how to do it. Dewar and Werbel (1979) defined the “nature of formalization” as the degree to which workers are provided with rules and procedures that deprive versus encourage creative, autonomous work and learning. Additionally, Olson et al. (2005) refer to formalization as the degree to which decisions and working relationships are governed by formal rules and procedures. In this study, we used Hage and Aiken’s (1967) definition of formalization. They define formalization as “the use of rules in an organization” (p. 79). It was considered to have two sub-dimensions: job codification, “the degree to which the job descriptions are specified” and rule observation, “the degree to which job occupants are supervised in conforming to the standards established by job codification” (p. 79). Later, Aiken and Hage (1968) added another sub-dimension, job specificity, which they defined as the degree to which procedures defining jobs are spelled out. It has been argued by Tata and Prasad (2004), that larger organizations often formalize norms by specifying rules, procedures, instructions, and communications in writing, whereas smaller organizations can have unwritten, not explicitly formalized norms.

Research Methodology

The research task in this study is to assess the goodness of measure (validity and reliability) of the organizational structure measurement. The procedure suggested by Churchill (1979) was followed but nomological validity was not tested as this instrument is not a newly developed one but one that has been in popular use. The environment in which this study was carried out was in the Malaysian manufacturing and services sector.

Sample

The sample was drawn from a membership list of companies from the Federation of Malaysian Manufacturers' 2006. A total of 840 samples were picked from the list (620 for manufacturing and 220 for service sector). These firms were then mailed the questionnaire containing a cover letter and pre-paid reply envelope addressed to the Human Resource Manager. A total of 90 responses were obtained in the following 12-week period (from July till October 2006). This represented a response rate of 10.2 percent. The response rate is lower because the data obtained is only at the preliminary stage of the data collection. This study was part of a larger-scale study investigating the antecedents and outcome of empowerment of line managers.

Survey instrument

The instrument for this study is based on the work of Hage and Aiken (1967, 1970) which was used by Dewar et al. (1980). The instrument includes four items on the participation in decision making, five items of hierarchy of authority, five items on job codification, two items of rule observation, and another six items to measure job specificity. The instrument includes a total of 22 items. A seven-point Likert scale was used.

Research Results

The profile of the responding companies is shown in Table 1. A majority of the respondents are from the manufacturing sector and there is a spread of companies in terms of size and also years of operation.

Testing the Goodness of Measure of the Organizational Structure Construct

Content Validity

Content validity refers to the extent to which an instrument covers the meanings included in the concept (Babbie, 1992). In a similar vein, Rubio, Berg-Weger, Tebb, Lee, and Rauch (2003) refer to content validity as the extent to which the items measure the same content or how well the content was sampled in the measure. Essentially, the goals of content validity are to clarify the domain of a concept and judge whether the measure adequately represents the domain (Bollen, 1989). Content validation results in a theoretical definition that explains the

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Table 1: Profile of Companies

Characteristics	Frequency	Percentage
Type of Organization		
Manufacturing	57	63.3
Service	33	36.7
Firm Size		
50-100 persons	6	6.7
101-250 persons	28	31.1
251-500 persons	19	21.1
501-1000 persons	16	17.8
More than 1000 persons	21	23.3
Years in Operation		
Less than 5 years	3	3.3
Between 5 to 10 years	15	16.7
Between 11 to 15 years	27	30.0
Between 16 to 20 years	13	14.4
More than 20 years	32	35.6

meaning of the variable in question (Bollen, 1989) and is guaranteed by the literature overview (Gomez, Lorente, & Cabrera, 2004).

Construct Validity

Researchers often use factor analytic techniques to assess construct validity of the scores obtained from an instrument (McCoach, 2002). Factor analysis represents a broad category of approaches and mathematical procedures for determining the latent variable structure of observed variables (Nunnally, 1978). In this study, an exploratory factor analysis with an orthogonal varimax rotation was used to evaluate the construct validity of scores from the instrument. To evaluate the construct validity, we performed a principal component analysis on the set of 22 items listed in the scale. The results of this analysis is summarized in Table 2. The analysis extracted six factors, each with eigenvalues above one, which explained 69.17 per cent of the total variance. Based on the rotated component matrix, item 10 was dropped due to loadings less than 0.5 in the anti image correlation. All the other items selected had factor loadings greater than 0.5. Even though there were some items where the cross loadings slightly exceeded 0.30, these items were retained because factor analysis should take into consideration the need for a conceptual basis for the variables analyzed (Hair, Black, Babin, Anderson, & Tatham, 2006).

Items 18, 19, 20, 21, and 22 loaded onto Factor 1. Factor 1 was labeled as CENTRALIZATION – Hierarchy of Authority. In Factor 2, items 8, 9, 11, and 12 were included and then labeled as FORMALIZATION – Job Specificity. Item 1, 2, 3, 4, and 5 loaded onto Factor 3 and remained as FORMALIZATION – Job Codification. Factor 4 consisted of four items (question 14, 15, 16, and 17) that represent CENTRALIZATION – Participation in Decision Making. Factor 5 included only two items (question 6 and 7) and thus was labeled as FORMALIZATION – Rule Observation. Finally, Factor 6 was deleted and dropped from further analysis contained item 13 which was dropped as it was a single item factor. Table 2 summarizes the factor loadings obtained.

Convergent Validity

Further to the construct validity test using the factor analysis (between scales) another factor analysis but this time using the within scale was utilized to test the convergent validity. According to Campbell and Fiske (1959), convergent validity refers to all items measuring a construct actually loading on a single construct. Convergent validity is established when items all fall into 1 factor as theorized. Convergent validity was carried out through a within factor, factor analysis in order to obtain a more in-depth judgement of the dimensionality of the construct under study (Hair et al., 2006). All the five factors displayed unidimensionality with CENTRALIZATION – Hierarchy of Authority, KMO was 0.77 explaining 66 percent of the variation; FORMALIZATION – Job Specificity, KMO was 0.73 explaining 66 percent of the variation; FORMALIZATION – Job Codification, KMO was 0.71 explaining 55 percent of the variation; CENTRALIZATION – Participation in Decision Making, KMO was 0.68 explaining 70 percent of the variation; and lastly FORMALIZATION – Rule Observation, KMO was 0.50 explaining 72 percent of the variation. Thus, the analysis provided evidence of convergent validity.

Discriminant Validity

Further validation of the scale was done by testing the factors of organizational structure for discriminant validity. Discriminant validity refers to the extent to which measures of 2 different constructs are relatively distinctive. The correlation value of discriminant validity is neither an absolute value of '0' or '1' (Campbell & Fiske, 1959). A correlation analysis was done on the five factors generated and the results are presented in Table 3. Only three of the ten inter-factor correlations were significant but none had correlation coefficients exceeding 0.5. The inter-factor correlation suggests that the organizational structure factor have adequate discriminant validity.

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Table 2: Factor Analysis Hage & Aiken's Organizational Structure Items*

	Items	Factors					
		1	2	3	4	5	6
Hierarchy of authority	18	There can be little action taken here until a supervisor approves a decision	<u>0.61</u>				
	19	A person who wants to make his own decision would be quickly discouraged here	<u>0.79</u>				
	20	Even small matters have to be referred to someone higher up for a final answer	<u>0.77</u>				
	21	I have to ask my boss before I do almost anything	<u>0.85</u>				
	22	Any decision I make has to have my boss' approval	<u>0.83</u>				
Job specificity	8	Whatever situation arises we have procedures to follow in dealing with it		<u>-0.76</u>			
	9	Everyone has a specific job to do		<u>0.79</u>			
	11	This organization keeps written records of everyone's job performance		<u>0.80</u>			
	12	We are to follow strict operating procedures at all times		<u>0.77</u>			
Job codification	1	I feel I am my own boss in most matters			<u>0.55</u>		
	2	A person can make his own decisions without checking with anybody else			<u>0.77</u>		
	3	How things are done around here is left up to the person doing the work			<u>0.80</u>		
	4	People here are allowed to do almost as they please			<u>0.81</u>		
	5	Most people here make their own rules on the job			<u>0.71</u>		

Continued

Table 2: *Cont'*

	Items	Factors						
		1	2	3	4	5	6	
Participation in decision making	14	How frequently do you participate in the decision on the adoption of new programs?	-0.41			0.64		
	15	How frequently do you participate in decisions on the adoption of new policies?	-0.39			0.73		
	16	How frequently do you participate in the decision to hire new staff?				0.88		
	17	How frequently do you participate in the decisions on the promotions of any of the professional staff?				0.87		
Rule observation	6	The employees are constantly being checked on for rule violations					0.86	
	7	People here feel as though they are constantly being watched to see that they obey all the Rules					0.73	-0.48
	13**	<i>Whenever we have a problem we are supposed to go to the same person for an answer</i>	0.38					0.57
		Eigen value	5.17	3.11	2.92	1.58	1.41	1.04
		Percentage of Variance	23.49	14.12	13.27	7.18	6.39	4.73
		Reliability (Cronbach Alpha)	0.87	0.83	0.79	0.86	0.62	-
		Mean	3.78	5.21	3.18	5.04	3.76	-
		(Standard Deviation)	1.37	1.08	1.08	1.20	1.15	-

Note:* Loadings below 0.3 were suppressed for greater readability

** Item 13 was not used in further analysis as it was a single item factor

Reliability

Reliability measures the degree to which the test score indicates the status of an individual item on the factors defined by the test, as well as the degree to which the test score demonstrates individual differences in these traits (Cronbach, 1947 as cited in McCoach, 2002). "A reliability coefficient demonstrates whether

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Table 3: Results of the Correlation Analysis and Cronbach Alpha

Factors	1	2	3	4	5
1	(0.87)				
2	-0.222*	(0.83)			
3	0.006	-0.199	(0.79)		
4	-0.353**	0.411**	0.069	(0.86)	
5	-0.083	-0.148	0.006	-0.135	(0.62)

**p < 0.01, *p < 0.05

Values in the diagonal are the Cronbach alpha values

Note: 1 = Centralization – Hierarchy of Authority, 2 = Formalization – Job Specificity, 3 = Formalization – Job Codification, 4 = Centralization – Participation in Decision Making, 5 = Formalization – Rule Observation

the test designer was correct in expecting a certain collection of items to yield interpretable statements about individual differences” (Cronbach, 1951, p. 297 as cited in McCoach, 2002). Generally, Nunnally (1978) proposed 0.70 to be the minimum acceptable standard for internal consistency. However, reliabilities of .40 are acceptable when the factor comprise only two or three items (Hinkin, 1995). The five corresponding alpha values are 0.87, 0.83, 0.79, 0.86, and 0.62 for CENTRALIZATION – Hierarchy of Authority, FORMALIZATION – Job Specificity, FORMALIZATION – Job Codification, CENTRALIZATION – Participation in Decision Making, and FORMALIZATION – Rule Observation respectively. Hence, it can be concluded that these measures posses sufficient reliability.

Discussion and Conclusion

Most researchers rely on use and performance of instruments in other studies as culled from the standard literature review to establish the goodness of a measure. Contextual and cultural differences can and often do affect the accuracy of the instruments leading to new measurement errors. Psychometricians (see for example, Jacoby, 1978; Teoh, 2006) have warned of the folly of blindly applying instruments developed for specific purposes and tested in western setting. To remain vigilant and to develop robust measures, all and especially popular measures such as Hage and Aiken’s organisational structure instruments, must be regularly tested for validity. The objective of this study was to review the validity and reliability of organizational structure scale that was developed and predominantly used in western settings to the Malaysian context. The procedure suggested by Churchill (1979) provides a rigorous and dedicated study to put the measures to the fullest test i.e. construct validity, convergent validity, discriminant validity and reliability. Although Churchill (1979) recommended

Multitrait-Multimethod approach to construct validity, a simpler version based on single measure was used in this study.

The factor analysis produced a six factor solution instead of the five factors posited in Hage & Aiken's instruments. The last single item factor was dropped from analysis as it constituted only one item from the scale. Despite some cross loadings, the factor structure substantially reproduced the same dimensions as the original scale. The inter-factor correlation was mainly supportive of the discriminant properties of the scale i.e. the correlations were mostly not significant and low. Thus, elements of construct validity i.e. convergent and discriminant validity were both adequately demonstrated.

The present study employed the classical approach to construct validation i.e. using Exploratory Factor Analysis and also correlations as the primary statistical method, to examine and confirm construct validity (Segars & Grover, 1993). The more popular Confirmatory Factor Analysis approach could not be used as the sample size needed for the use of SEM analysis was not achieved (recommended sample size is 200, Hair et al., 2006: 741).

In conclusion, although the conceptualisation of and research on organisational structure by Hage and Aiken (1967, 1970) has had a major impact on organizational studies, researchers must reaffirm that the instrument continues to measure the construct validly and reliably to mitigate measurement errors. It is especially important for those researching in non-western setting to reassess the goodness of this measure before adoption. This research showed that the instrument still has reasonable levels of validity and reliability for continued use.

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YUSLIZA MOHD. YUSOFF & T. RAMAYAH, School of Management, Universiti Sains Malaysia, 11800 Minden Pulau Pinang, Malaysia, e-mail: yusliza1977@yahoo.com, ramayah@gmail.com

HAZMAN SHAH ABDULLAH, Faculty of Administrative Science & Policy Studies, Universiti Teknologi MARA 40450 Shah Alam, Selangor, Malaysia e-mail: hazman@salam.uitm.edu.my