

A Hierarchical Latent Variable Model of Leadership Styles using PLS-SEM

Azlin Shafinaz Arshad^{a,b*}, Chin Fei Goh^a, Amran Rasli^a

^aFaculty of Management, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia

^bMalaysian Academy of SME & Entrepreneurship Development (MASMED), Universiti Teknologi MARA, Malaysia

*Corresponding author: azlin@salam.uitm.edu.my

Article history

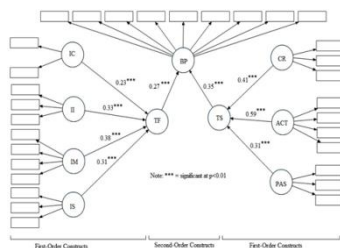
Received :1 January 2014

Received in revised form :

15 February 2014

Accepted :18 March 2014

Graphical abstract



Abstract

The aim of this article is to propose second order hierarchical component models to analyze the two leadership styles (transformational leadership and transactional leadership) for technology-based SMEs. We adopted the two-stage approaches in partial least square-structural equation modelling to examine the appropriateness of hierarchical modelling for both leadership styles. The findings indicate that the conceptual properties of transformational leadership and transactional leadership are matched with reflective-formative type of second order hierarchical component models. In addition, the study offers an alternative avenue to those researchers who are intending to introduce hierarchical component models in modelling leadership styles.

Keywords: Partial least squares; hierarchical latent variable; transformational leadership; transactional leadership

© 2014 Penerbit UTM Press. All rights reserved.

1.0 INTRODUCTION

The success or failure of any business depends largely on the leadership styles practiced by the leaders. According to Jeremy, Melinde and Ciller, the relationships between the leader and employees are significantly influenced by the leadership style practised by the leader [1]. Leadership style in an organization is one of the factors that play a significant role in enhancing or retarding the interest and commitment of the individuals in the organization [2]. The leaders employ combination of their traits, skills and behaviors when interacting with their followers [3]. Firm's effectiveness and performance would differ when leaders apply different leadership styles in leading the organization [4]. The importance of leadership styles in influencing business performance has been evidenced in numerous studies [2, 5, 6, 7] However, the application and usage of hierarchical construct models using partial least squares-structural equation modeling (PLS-SEM) (or PLS path modeling) are still limited [8].

A hierarchical constructs or multidimensional constructs involves constructs having more than one dimension [9-12]. The hierarchical modeling is used in modeling a level of abstraction higher than that first order constructs under hierarchical reflective or formative framework [8, 13]. Chin pointed out hierarchical latent variable models or higher-order constructs are the representations of multidimensional constructs that exist at a higher level of abstraction and are related to other constructs at a similar level of abstraction which completely mediating the

influence from or to their underlying dimensions [14]. The objective of this paper is to develop a hierarchical construct of leadership styles model in which we intend to show PLS path modeling can be used to estimate the parameters of a higher order model. Specifically, we developed a hierarchical construct model of leadership styles in this study to assess a formative higher-order construct for transformational leadership and transactional leadership in the context of technology-based SMEs in Malaysia. To the best of our knowledge, this study represents the first attempt to propose that leadership styles can be modeled as hierarchical constructs using PLS path modeling.

2.0 LITERATURE REVIEW

There are various types of leadership styles which have been developed by scholars. This study will emphasize on transformational and transactional leadership introduced by Avolio and Bass [15]. Transformational leadership involves inspiration and charisma. It involves leaders to come up with strategic and clear vision and communicate it effectively with their subordinates [16]. The main components of transformational style are idealized influence (II), inspirational motivation (IM), individualized consideration (IC) and intellectual stimulation (IS). Idealized influence is the behavior that arouses strong follower emotions and identification with the leader while inspirational motivation is where leaders behave in ways that motivate and

inspire people by providing meaning and challenge to their follower's work [17, 18]. A leader with individualized consideration behavior needs to act as coach and mentor by giving attention to their follower needs [18]. Intellectual stimulation leaders allow employees to be creative and innovative in their work activities [15].

The transactional leadership is concerned with exchange system between leaders and followers [4]. It involves leaders who provide direction and able to stimulate followers to achieve objectives by clarifying their responsibility and work obligation [19]. Transactional leadership can be divided into contingent reward, management by exception active and management by exception passive. Contingent reward (CoRe) is an exchanging of rewards where employees are being rewarded for the work done [15]. This can be regarded as motivation and encouragement to perform better. Active management by exception (ACT) is when leader supervises employees in order to prevent mistakes being made. As explained by Avolio and Bass, leader chooses to be involved with subordinates to ensure all is in accordance and takes corrective actions when necessary [15]. For passive management by exception (PAS), interferences from leader would only take place when things are not right [15]. Here, employees are encouraged to make mistakes and corrective actions are taken when mistakes are being made.

Many researchers measured business performance using subjective indicators and objective indicators. As explained by Tsai, MacMillan and Low, both measures able to increase the accuracy in measuring the performance of a firm [20]. However, earlier studies preferred to adopt self-reported measures in collecting business performance data which have resulted to be reliable [21]. In this study, the researcher adopted self-reported subjective measures where the performance of the firm is measured by the perceptions of the owners/managers. Chandler and Hanks found that self-reports of firm performance from the owner/manager were highly correlated with archival data [22]. In addition, public information is unreliable because most SMEs are privately held and have no legal obligation to disclose information to the public [5] and they are reluctant to provide actual financial data [23].

Based on the discussion above, the following hypotheses were developed:

- H1a: IC is positively related to overall TF
- H1b: II is positively related to overall TF
- H1c: IM is positively related to overall TF
- H1d: IS is positively related to overall TF

- H2a: CoRe is positively related to overall TF
- H2b: ACT is positively related to overall TF
- H2c: PAS is positively related to overall TF

- H3: Transformational leadership style is positively related to business performance
- H4: Transactional leadership style is positively related to business performance

■3.0 METHODOLOGY

A quantitative method was adopted in this study using survey questionnaire. As database for technology-based SMEs are not readily available, the researchers has approached an integrated venture capital company for assistance. The company has been entrusted by the Malaysian government in overseeing the development of technology-based firms in Malaysia. The researchers require filtering the list of technology-based firms

according to the definition of SME by SME Corp to ensure representativeness of the study. A total of 150 questionnaires were distributed to technology-based firms using a simple random sampling method in which 100 firms responded to the survey. Out of this amount only 86 responses were deemed to be usable. The respondents were the top management of the technology-based SMEs due to their expertise and knowledge in terms of the directions of the firm. In addition, they are the most informed individuals about the firms' overall operational activities [5].

A self-reporting instrument was developed for this study in the form of survey questionnaires into three sections which consists of close-ended questions. The leadership style items were adapted from the Multifactor Leadership Questionnaire (MLQ) by Avolio and Bass represented by transformational leadership and transactional leadership [15]. The business performance measurement items were based on financial and non-financial indicators which were adopted from previous studies [24-25]. Finally, the last section consists of business background of the firm. To ease coding and data interpretation, the scaling format was measured on five-point scale to reduce confusion among respondents and to ensure decision is made much more swiftly.

■4.0 FINDINGS

In this study, the researchers investigate whether transformational leadership and transactional leadership can be conceptualize as second order hierarchical components models (reflective-formative type) in which the first order components (measured by reflective factors) form the second-order components. As suggested by Becker, Kleinand and Wetzels, two-stage approaches were adopted to model higher-order constructs [26]. In the first step, estimation of the first order constructs for both transformational leadership and transactional leadership were conducted and followed by saving the latent variable scores. In the second step, the obtained latent variable scores were used as formative indicators. The SmartPLS version 2.0 is used to estimate the empirical model [27]. According to the guidelines recommended by Hair, Ringle and Sarstedt, we performed measurement models to examine indicator validity [28]. Specifically, we investigated the indicator loadings were between 0.40 and 0.70 where those indicators with loading greater than 0.7 are accepted. As a result, three items with loadings between less tahn 0.7, i.e., item TF_IC2, TF_II2, TF_IM5 in TF_IC, TF_II and IM constructs respectively were removed. The rationale is the deletion of aforementioned items increase composite reliability (CR) or average variance extracted (AVE) in first order component of transformational leadership. Thereafter, we managed to obtain evidence of indicator reliability and construct validity. Table 1 reports the quality assessment of measurement models of first order components and endogenous construct in the final empirical model.

Table 1 Assessment of measurement models of reflective first-order constructs and endogenous construct

Construct	Dimension	Indicator	Loading	CR	CA	AVE	
TF	IC	TF_IC1	0.89	0.87	0.70	0.77	
		TF_IC3	0.87				
	II	TF_II2	0.79	0.83	0.70	0.62	
		TF_II3	0.78				
		TF_II4	0.79				
	IM	TF_IM1	0.71	0.80	0.67	0.50	
		TF_IM2	0.72				
		TF_IM3	0.69				
		TF_IM4	0.71				
	IS	TF_IS1	0.79	0.82	0.67	0.60	
		TF_IS2	0.78				
		TF_IS3	0.76				
TS	CoRe	TS_CR1	0.81	0.84	0.72	0.64	
		TS_CR2	0.80				
		TS_CR3	0.79				
	ACT	TS_A1	0.80	0.86	0.77	0.60	
		TS_A2	0.77				
		TS_A3	0.82				
		TS_A4	0.70				
	PAS	TS_P1	0.76	0.83	0.69	0.61	
		TS_P2	0.83				
		TS_P3	0.76				
	BP		BP01	0.75	0.93	0.91	0.59
			BP02	0.72			
BP03			0.79				
BP04			0.75				
BP05			0.79				
BP06			0.73				
BP07			0.76				
BP08			0.81				
BP09			0.80				

Note: TF = Transformational leadership; TS = Transactional leadership; BP = Business performance; IC = Individualized consideration; II = Idealized influence; IM = Inspirational motivation; IS = Intellectual stimulation; CoRe = Contingent reward; ACT = Management by exception (active); PAS = Management by exception (passive)

Four methods of assessment were adopted to assess the adequacy of the measurement assessment which are indicator reliability, internal consistency reliability, convergent validity and discriminant validity. The results of the measurement assessment are shown in Table 1. In the first method, it was observed the outer loadings for individual indicator for first order constructs and endogenous construct exceed the minimum threshold of 0.7 [28]. Next, it was found that composite reliability (CR) for reflective constructs exceeded the condition of 0.7 [28]. The

internal consistency reliability was further supported by relatively high Cronbach's Alpha (CA) in which the lowest value is 0.67. Third, the convergent validity was achieved because all AVE are greater than required minimum value of 0.50 [28]. Finally, the discriminant validity of reflective constructs was confirmed using Fornell-Lacker criterion where the average variance extracted (AVE) of each reflective constructs are greater than the highest bivariate correlations between the constructs as depicted in Table 2.

Table 2 Discriminant validity assessment (Fornell Lacker Criterion)

	IC	II	IM	IS	CoRe	ACT	PAS
IC	0.88						
II	0.43	0.79					
IM	0.42	0.64	0.71				
IS	0.41	0.49	0.59	0.78			
CoRe	0.00	0.00	0.00	0.00	0.80		
ACT	0.00	0.00	0.00	0.00	0.00	0.77	
PAS	0.21	0.21	0.31	0.38	0.26	0.27	0.78

Note: The diagonal elements (in bold) are the square root of Average Variance Extracted. Other non-diagonal elements are latent variable correlations

Bootstrapping procedure was adopted with 5,000 bootstrap samples to obtain the statistical significance of path coefficient estimates [28]. Figure 1 shows the path coefficient estimates and the level of statistical significance in our empirical model.

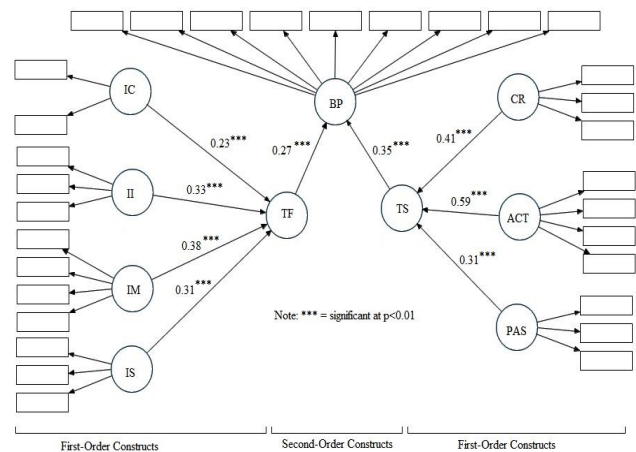


Figure 1 Structural path model

Overall, the results support our conceptualization of transformational leadership and transactional leadership to be second order hierarchical components models (reflective-formative type). Note that the first order component (reflective constructs) was verified in above discussions. The formative second-order construct for transformational leadership was verified because the dimensions of IC, II, IM and IS have are positively related ($p < 0.01$) on overall transformation leadership. In a similar vein, the dimensions of CR, ACT and PAS exhibit positive relationships with overall transactional leadership are positively related ($p < 0.01$), thus it is regarded as a second order formative construct. In other words, hypotheses H1a-H1d and H2a-H2c were supported. It is worth to mention that transactional leadership and transformational leadership exhibit a positive

causal effect ($p < 0.01$) on business performance, which denotes that hypotheses H3 and H4 were supported.

5.0 CONCLUSION

The purpose of this study is to develop a hierarchical construct of leadership styles model (transformational leadership and transactional leadership) and to show PLS path modeling can be used to estimate the parameters of a higher order model. The findings show that transformational leadership and transactional leadership can be conceptualized as reflective-formative type models of hierarchical latent variables in PLS path modeling. Specifically, the researchers propose the first order components of both leadership styles can be measured by reflective factors. Then, the researcher used a sample of technology-based SMEs to examine whether such leadership styles can be verified as reflective-formative type models.

This study has an important methodological contribution in PLS-SEM in modelling leadership styles. In particular, this study represents the first attempt to examine whether leadership styles can be interpreted as hierarchical latent variables. Our modelling approach in this study offers an alternative avenue to estimate complicated models that consists of high number of lower order dimensions. Compared to the current practice to use aggregate method to measure multiple items in lower order dimensions, the hierarchical latent variables deliver an advantage to identify and explain lower order dimensions separately in a more precise manner. Additionally, the modelling through hierarchical latent variables can reduce model complexity in which theoretically parsimonious. As such, this study can assist researchers who are interested in modelling leadership styles with high number of lower order dimensions to focus the analysis on path relations instead of lower order dimensions.

References

- [1] Jeremy, M., Melinde, C. and Ciller, V. 2012. Perceived Leadership Style and Employee Participation in a Manufacturing Company in the Democratic Republic of Congo. *African Journal of Business Management*. 6(15): 5389–5398.
- [2] Obiwuru, T. C., Okwu, A.T., Akpa, V. O. and Nwankwere, I. A. 2011. Effects of Leadership Style on Organizational Performance: A Survey of Selected Small Scale Enterprises in Ikosi-ketu Council Development Area of Lagos State, Nigeria. *Australian Journal of Business and Management Research*. 1(7): 100–111.
- [3] Lussier, R. N. and Achua, C. F. 2004. *Leadership: Theory, Application, Skill Development*. 2nd ed. Eagan, MN: Thomson-West.
- [4] Nahavandi, A. 2002. *The Art and Science of Leadership*. 3rd ed. Upper Saddle River, New Jersey: Prentice Hall.
- [5] Yang, C. W. 2008. The Relationships among Leadership Styles, Entrepreneurial Orientation and Business Performance. *Managing Global Transitions*. 6: 257–275.
- [6] Yildirim, H. and Saygin, S. 2011. Effects of Owners' Leadership Style on Manufacturing Family Firms' Entrepreneurial Orientation in the Emerging Economies: An Empirical Investigation in Turkey. *European Journal of Economics, Finance and Administrative Sciences*. 32: 26–32.
- [7] Ojokuku, R. M., Odetayo, T. A. and Sajuyigbe, A. S. 2012. Impact of Leadership Style on Organizational Performance: A Case Study of Nigerian Banks. *American Journal of Business and Management*. 1(4): 202–20.
- [8] Wetzels, M., Odekerken-Schröder, G. & Van Oppen, C. 2009. Using PLS Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration. *MIS Quarterly*. 33(1).
- [9] Edwards, J. R. 2001. Multidimensional Constructs in Organizational Behavior Research: An Integrative Analytical Framework. *Organizational Research Methods*. 4(2): 144–192.
- [10] Jarvis, C. B., MacKenzie, S. B., and Podsakoff, P. M. 2003. A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research. *Journal of Consumer Research*. 30: 199–218.
- [11] MacKenzie, S. B., Podsakoff, P. M., and Jarvis, C. B. 2005. The Problem of Measurement Model Misspecification in Behavioral and Organizational Research and Some Recommended Solutions. *Journal of Applied Psychology*. 90(4): 710–730.
- [12] Petter, S., Straub, D., and Rai, A. 2007. Specifying Formative Constructs in Information Systems Research. *MIS Quarterly*. 31(1): 623–656.
- [13] Akter, S., D'Ambra, J. & Ray, P. 2010. Service Quality of Mhealth Platforms: Development and Validation of a Hierarchical Model Using Pls. *Electronic Markets*. 20(3–4): 209–227.
- [14] Chin, W. W. 1998. Issues and Opinion on Structural Equation Modeling. *MIS Quarterly*. 22(1): vii–xvi.
- [15] Avolio, B. J. and Bass, B. M. 2004. *Multifactor Leadership Questionnaire: Manual and Sample Set*. 3rd ed. Redwood City, CA: Mind Garden
- [16] Bass, B. M. 1985. *Leadership and Performance Beyond Expectations*. New York: Free Press
- [17] Yukl, G. 2006. *Leadership in Organizations*. 6th ed. Upper Saddle River, N.J. Pearson Prentice Hall.
- [18] Bass, B. M. and Riggio, R. E. 2006. *Transformational Leadership*. 2 ed. Mahwah, NJ: Lawrence Erlbaum Associates Inc..
- [19] Robbins, Stephen P. 2003. *Management*. French Forest, N.S.W, Pearson Education.
- [20] Tsai, W. M. H., MacMillan, I. C. and Low, M. B. 1991. Effects of Strategy and Environment on Corporate Venture Success in Industrial Markets. *Journal of Business Venturing*. 6: 9–28.
- [21] Knight, G. A. 2000. Entrepreneurship and Marketing Strategy: The SME Under Globalization. *Journal of International Marketing*. 8(2): 12–32.
- [22] Chandler, G. N. and S. H. Hanks. 1993. Measuring the performance of emerging businesses: A validation study. *Journal of Business Venturing*. 8: 391–408.
- [23] Tse, A. C. B., Sin, L. Y. M., Yau, O. H. M., Lee, J. S. Y. and Chow, R. 2004. A Firm's Role in the Market Place and the Relative Importance of Market Orientation and Relationship Market Orientation. *European Journal of Marketing*. 38(9/10): 1158–1172.
- [24] Gibson, C. and Birkinshaw, J. 2004. The Antecedents, Consequences, and Mediating Role of Organizational Ambidexterity. *Academy of Management Journal*. 47(2): 209–226.
- [25] Wolff, J. and Pett, T. 2006. Small-firm Performance: Modeling the Role of Product and Process Improvements. *Journal of Small Business Management*. 44(2): 268–284.
- [26] Becker, J.-M., Klein, K. and Wetzels, M. 2012. Hierarchical Latent Variable Models in PLS-SEM: Guidelines for Using Reflective-formative Type Models. *Long Range Planning*. 45(5–6): 359–394.
- [27] Ringle, C., Wende, S. and Will, A. 2005. Smartpls 2.0. University of Hamburg.
- [28] Hair, J. F., Ringle, C. M. and Sarstedt, M. 2011. PLS-SEM: Indeed a Silver Bullet. *The Journal of Marketing Theory and Practice*. 19(2): 139–152.