

ASSESSING COMMON METHOD BIAS: PROBLEMS WITH THE ULMC TECHNIQUE

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Appendix A

Techniques for Detecting CMB

This appendix outlines some of the more prevalent techniques for controlling and for detecting common method bias. These include (1) Harman's single factor test (Podsakoff et al. 2003), (2) partial correlation technique (Podsakoff et al. 2003), (3) multitrait-multimethod (MMTM) (Shadish et al. 2002), (4) the correlation marker technique, (5) confirmatory factor analysis (CFA) marker technique (Lindell and Whitney 2001), and (6) unmeasured latent method construct (ULMC) technique (Richardson et al. 2009). Table A1 includes descriptions of each CMB technique, their limitations and associated references. For a complete review of these techniques see Podsakoff et al. (2003), Richardson et al. (2009), and Williams et al. (2010). Rather than revisit in detail these techniques, which are familiar to IS researchers, this research note focuses on describing the ULMC technique (Richardson et al. 2009) and evaluating its ability to detect CMB when using PLS.

Table A1. Prevalent CMB Techniques			
Technique	Descriptions	Limitations	Literature
Harman's Single-Factor Test	Load all the items into an exploratory factor analysis and examines the unrotated solution. If CMB is present a single-factor will emerge from the factor analysis.	Does not control for method effects. It is unlikely a single factor will emerge from the data.	(Podsakoff et al. 2003)
Partial Correlation Technique	Technique used to control for effects of method variance. There are several variations but typically a factor with a specific meaning (e.g., social desirability) is used to partial CMB.	Assumes the CMB is only shared with the predictor factor and the dependent factor. Also, prevents examining the effects of the relative impact of distinct antecedents.	(Podsakoff et al. 2003; Williams et al. 1996)
Multitrait-Multimethod (MMTM)	Procedure whereby multiple methods are used to evaluate CMB by comparing the convergent and discriminant properties of the construct using a matrix.	MTMM requires several methods to collect data. It is more of a procedure than a statistical technique.	(Shadish et al. 2002)
Correlation Marker Technique	Controlling for CMB by partialing out the shared variance in correlations. A marker variable is best chosen a priori based on it being theoretically unrelated to the nomological network. Similar to other variables this marker variable may be contaminated by CMB.	Typically used <i>post hoc</i> and often concludes no CMB.	(Lindell and Whitney 2001; Richardson et al. 2009; Williams et al. 2010)
CFA Marker Technique	Adapted from the correlation marker technique for use in covariance based SEM whereby a theoretically unrelated marker construct is used to model CMB with paths to each of its own unique indicators as well as paths to the other constructs in the nomological network. The shared variance between the marker and the other constructs is representative of CMB.	Relatively underutilized and unproven	(Lindell and Whitney 2001; Richardson et al. 2009; Williams et al. 2010)
Unmeasured Latent Marker Construct (ULMC)	A latent variable used to represent and partial out the CMB. This variable is an aggregate of all manifest variables used in the study with no unique observed indicators.	Focus of this research note.	(Liang et al. 2007; Podsakoff et al. 2003; Richardson et al. 2009)

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Appendix B

Papers Citing Liang et al.

This appendix identifies papers that cite Liang et al. (2007) in dissertations, thesis, peer reviewed journal publications, conference proceedings, and working papers. Two members of the review team separately searched well-known databases (see Table B1) using the query “Liang, Saraf, Hu, and Xue” and also the title, “Assimilation of Enterprise Systems.”

The initial search for papers referencing Liang et al. took place during August and September, 2009. Updates were offered in accordance with each revision cycle. Accordingly, subsequent searches were conducted on January 18, 2011, March 7, 2011 and April 20, 2011. After conducting the searches, the reviewers compared results, and downloaded 176 papers that referenced Liang et al. Papers were then independently reviewed for how they used Liang et al. Papers were placed into two groups: (1) papers that cite Liang et al. for its theoretical or empirical contributions and (2) papers that cite the Liang et al. CMB technique. Perhaps given the simple nature of our categories, the researchers did not identify any differences in how articles were coded. The results of our review are presented in Table B2. We identified 92 studies that cite either the theoretical or empirical finding in Liang et al. More importantly, we found 76 studies that use the Liang et al. approach to assess CMB’s influence on their statistical analysis, including seven articles in recent issues of *MIS Quarterly*.

Table B1. Databases Searched

ACM Digital Library
AIS Digital Library
Business Xource Premier
EBSCO
ISI Web of Knowledge
ISI Web of Science
Google Scholar
Springer Link
Scopus Database

Table B2. Citation Counts for Liang et al.		
Cites Liang et al. for theoretical purposes or empirical results of study.		
Journal Publications	Arnold 2011; Balocco et al. 2009; Blaskovich and Mintchik 2011; Bose and Luo 2011; Chou and Chang 2008; Dong et al. 2009; Haug et al. 2010; Haug et al. 2009; Hu et al. 2007; Huang 2009; Jensen et al. 2009a, 2009b; Johnson 2008; Jones et al. 2008; Ke et al. 2009; Ke and Zhang 2009; Kouki et al. 2010; Li et al. 2010; Liang et al. 2010; Lin and Rohm 2009; Lin 2010; Liu and Seddon 2009; Liu et al. 2011; Metts 2007; Mignerat and Rivard 2009; Mishra and Agarwal 2010; Morris and Venkatesh 2010; Roberts et al. 2012; Rodon et al. 2010; Sarker and Valacich 2010; Seddon et al. 2010; Setia et al. 2011; Sharma et al. 2009; Shi et al. 2008; Shim et al. 2009; Vance et al. 2008; Venkatesh and Bala 2008; Weerakkody et al. 2009; Wong et al. 2009; Xue et al. 2008; Xue et al. 2011; Yamouchia and Swanson 2010; Zhu et al. 2010	43
Conference Publications	Aoun et al. 2009; Bai and Cheng 2010; Bharati 2010; Boh et al. 2008; Chen et al. 2009; Chen and Chou 2009; Elbashir et al. 2008; Gagnon and Pinsonneault 2009; Kirwan et al. 2008; Krell et al. 2008; Krell et al. 2009; Lai et al. 2008; Liu and Seddon 2009; Masli et al. 2009; Mishra and Mishra 2009b; Mithas et al. 2010; Pan 2008; Peng and Nunes 2010; Ram and Swatman 2008; Shao et al. 2008; Singh 2009; Sudzina et al. 2008; H. Sun 2009; Tan et al. 2010; Teo et al. 2010; Teoh et al. 2010; Tsai and Tang 2009; Wang 2008; Wolf et al. 2009; Wu et al. 2008, 2009; Xu et al. 2010; Yoo et al. 2007; Yu et al. 2008; Y. Zhang et al. 2008	36
Book Chapters	Kumar et al. 2008; Mishra and Mishra 2009a	2
Dissertations / Thesis	Berente 2009; Brown 2009; Cereola 2008; Chang 2007; Chou 2008; Hong 2008; Kowshik 2010; Liu 2009; Pongpatrachai 2010	9
Working Paper	Svejvig 2009; Zand and van Beers 2011	2
	Total	92
Cites Liang et al. for common method technique.¹		
Journal Publications	Boss et al. 2009; Bulgurcu et al. 2010; Burton-Jones 2009; Chai et al. 2011; Chalhoub 2011; Chandra et al. 2010; Chen et al. 2010; Choi et al. 2010; Cyr et al. 2009; Elbashir et al. 2011; He et al. 2009; Herath and Rao 2009; Hess et al. 2009; Hsieh et al. 2008; Huang 2009; Iacovou et al. 2009; Im and Rai 2008; Johnson 2008; Kang et al. 2009; Ke and Zhang 2009; Kim and Han 2009; Kim 2011; Koh et al. 2010; Koo and Wati 2010; Kumar et al. 2011; Li et al. 2010; Li et al. 2008; Liang and Xue 2010; Liu et al. 2011; Neufeld et al. 2010; Park et al. 2008; Park et al. 2009; Pathak et al. 2007; Pathak et al. 2010; Rosenzweig 2009; Shim et al. 2009; Siponen and Vance 2010; Smith and Agarwal 2010; H. Sun 2010a, 2010b; Urbach and Ahlemann 2010; Vance et al. 2008; Wang et al. 2010; Wu and Kuo 2008; Xue et al. 2011; P. Zhang et al. 2008	46
Conference Publications	Balaji and Brown 2010; Bloos and Schwarze 2009; Bonner et al. 2010; Braun et al. 2010; Caya et al. 2008; Elbashir et al. 2008; Liu et al. 2010; Martin et al. 2008; Meade et al. 2007; Ren et al. 2009; Schouten et al. 2010; Shen et al. 2008; Sun 2009; Sun and Zhang 2008; Wolf et al. 2009; Zhang et al. 2010	17
Dissertations / Thesis	Avery 2010; Chang 2007; Cuellar 2008; Draaijer 2008; Glover 2008; Jiang 2008; Kowshik 2010; Li 2010; Park 2008; J. Sun 2010; Teague 2010; Yeh 2009; Yoon 2009	13
	Total	76

¹As noted in the paper, Vance et al. (2008) also propose the UMLC approach to CMB. We found one thesis that referenced this paper: Pallud, J., "A User-Centered Perspective on Information Technologies in Museums," Computer Information Systems, Georgia State University, 2009.

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Appendix C

PRELIS Syntax for Monte Carlo Simulations

The following table presents an example of the syntax used to generate the population data. In this example we use noncongeneric factor loadings of .7, noncongeneric common method loadings of .4 and a random error.

Table C1. Sample of PRELIS Syntax

Generating Sample RAW DATA for 6 indicators per construct; n=5000

DA NO=5000 RP=1

CO ALL

NE CMB=NRAND

NE XX=NRAND

NE YY=.6*XX + .8*NRAND

NE A1 = .70*XX + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE A2 = .70*XX + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE A3 = .70*XX + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE A4 = .70*XX + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE A5 = .70*XX + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE A6 = .70*XX + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE B1 = .70*YY + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE B2 = .70*YY + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE B3 = .70*YY + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE B4 = .70*YY + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE B5 = .70*YY + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

NE B6 = .70*YY + 0.4*CMB + 0.59160797830996160425673282915616*NRAND

OU RA=cmb2.pre WI=12 ND=6 XM IX=27993