

Uncovering Governance And Mindfulness Patterns For Improved Performance: The Role Of Management Accounting Systems Change

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ABSTRACT

This study extends the model developed in Williams and Seaman's [Williams, J. J. and Seaman, A. E. (2010). Corporate Governance and Mindfulness: The Impact of Management Accounting Systems Change, The Journal of Applied Business Research, Vol. 26, No. 5, pp. 1-17] exploratory paper examining the moderating effects of management accounting systems (MAS) change on the corporate governance/mindfulness relationship for a Canadian sample of 124 top-level accounting professionals. Canonical correlation analysis was applied to the linkage of multiple cognitive processes of mindfulness (Weick and Sutcliffe, 2001; 2007) and the governance dimensions of performance and conformance specified by the International Federation of Accountants (2009), underpinned by the moderating effects of five different components of MAS change, which yielded 13 significant relationships. The latter were subsequently analyzed for important gestalts (i.e., patterns) in the overall relationship, and assessed within the context of aligning professional accounting practices involving systems changes to the IFAC (2009) governance framework. These findings appear to have implications for improved governance structures in practice as well as offering a rich foundation for future research.

Keywords: Governance; Compliance; Performance; Mindfulness; Management Accounting Systems Change

INTRODUCTION

For the corporate world, the recent global financial crisis is a brutal audit of what happens when failures of expectations occur and the environment suddenly becomes increasingly complex and unpredictable. Resilience in business operations is severely tested, corporate governance is questioned, and the reliability associated with normal business operations is thwarted – all of which add pressure to securing organization effectiveness. To regain normalcy, the practice literature in accounting (International Federation of Accountants, 2008; 2009; PricewaterhouseCoopers, 2008) calls for evaluating and improving corporate governance, and hence reliability, through changing compliance and performance routines to emulate 'best practices' since they are "strongly aligned" (International Federation of Accountants, 2009, p. 6) with activities that overarch the role of the professional accountant in business. An alternative for enhancing effectiveness is offered in the literature on high reliability organizations (HROs) (Hannan and Freeman, 1984; Woods, 1988; Weick and Sutcliff, 2001; Weick, Sutcliffe and Obstfeld, 1999). To manage expectations successfully and secure reliability, it is necessary to continually focus on five cognitive processes comprising mindfulness that "tracks small failures, resists oversimplification, remains sensitive to operations, maintains capabilities for resilience, and takes advantage of shifting locations of expertise" (Weick and Sutcliffe, 2007, p. 2).

In a pioneering study, Williams and Seaman (2010) [hereafter W&S], reported that the conformance and performance dimensions of corporate governance are significant determinants of mindfulness. Moreover, this relationship is not only maintained under conditions of management accounting systems (MAS) change but is found

to be significantly stronger under high versus low levels of change. What is not addressed in that study, nor the literature at large, is whether different dimensions of MAS change might support systematically different degrees of importance of mindfulness processes that interrelate with governance routines. Knowledge of these emergent patterns offers managers, and professional accountants alike, more insight into the social infrastructure of reliability and the capability for reducing errors that lead to improved governance and thus effectiveness.

This paper, therefore, revisits the work of W&S and extends the analysis in two important respects. First, the concept of mindfulness is disaggregated into its component processes and related to the governance dimensions using canonical correlation, thereby controlling for the simultaneous interaction effects in each set of variables. The purpose is to discover important patterns of variables in this relationship that are otherwise undetectable using traditional multiple regression analysis. Secondly, emergent patterns using this approach are examined for each of five sub-systems of (MAS) change following the work of Libby and Waterhouse (1996). The rationale underpinning these linkages is presented in the next section of this paper followed by a discussion of the research approach, method, results, and implications. Several implications of the findings and suggestions for future research close out the paper.

BACKGROUND

The mission statement of the IFAC (2009) for global professional accountants is grounded in building long-term sustainable organizational success. Part of this initiative is reflected in the “International Good Practice Guidance: Evaluating and Improving Governance in Organizations” (IFAC, 2009, p. 5) which clearly identifies the role of the professional accountant as: (1) developing and interpreting information for strategy, planning, decision-making and control; (2) recording transactions, measuring performance, and communicating the results; (3) managing risk, business assurance, and internal control; and (4) using resources to create value and organizational innovation. The IFAC (2009) governance structure is predicated on the two dimensions of performance and conformance, and appears to be endorsed in much of the institutional accounting literature on governance (e.g., PricewaterhouseCoopers, 2008; KPMG, 2010). As shown in Figure I, routines focusing on value creation, strategy, and communication underpin the performance dimension while accountability, assurance, and risk management constitute the conformance dimension. It is these governance systems that need to be benchmarked against successful organizations, and which must be evaluated and changed to adapt to future opportunities and threats (IFAC, 2009).

But how is the IFAC (2009) platform of governance action linked to managing expectations and the concept of mindfulness? Drawing on the HRO literature, Weick et al. (1999) succinctly describe how a repertoire of action capabilities, such as the one advocated by the IFAC for improving governance routines, is closely linked to the concept of mindfulness. They appeal to Westrum’s (1988) arguments that the willingness of organizations to deal with specific threats also implies that the same organizations are willing to see those threats and contemplate them. In the process of bringing new alternatives under their control, people not only expand their ability to act on them but, also, they enlarge the set of issues that can be mindfully noticed. Specifically, “... the richness of a state of mindfulness is determined by the richness of the action repertoire. The richness of that action repertoire, in turn, is determined partly by the extent to which the cognitive processes are stable and continue to develop and partly by the extent to which the repertoire of variable routines that uncover and manage unexpected events continues to expand” (Weick et al., 1999, p. 90). This perspective essentially underscores the need to move away from the traditional approach to success, which seems to be mired in stable processes, treating near misses as non-threatening, rewarding complacency, and promoting overconfidence – traits, it should be noted, that the IFAC (2009) does not positively sanction.

As sensible as the IFAC (2009) framework might be for improving and expanding the structure of corporate governance, it is nevertheless silent on the cognitive concept of mindfulness, its composition, how it is instrumental in fostering error reduction and, thus, able to promote better reliability in business operations. Paradoxically, the IFAC (2009) packages effectiveness as a compact set of routines to be sought whereas HROs define effectiveness as situations or events to be avoided. Weick et al. (1999, p. 108) untangle this contradiction: “The major determinant of reliability in an organization is not how greatly it values reliability or safety per se over other organizational values, but rather how greatly it *disvalues* the mis-specification, mis-estimation, and mis-

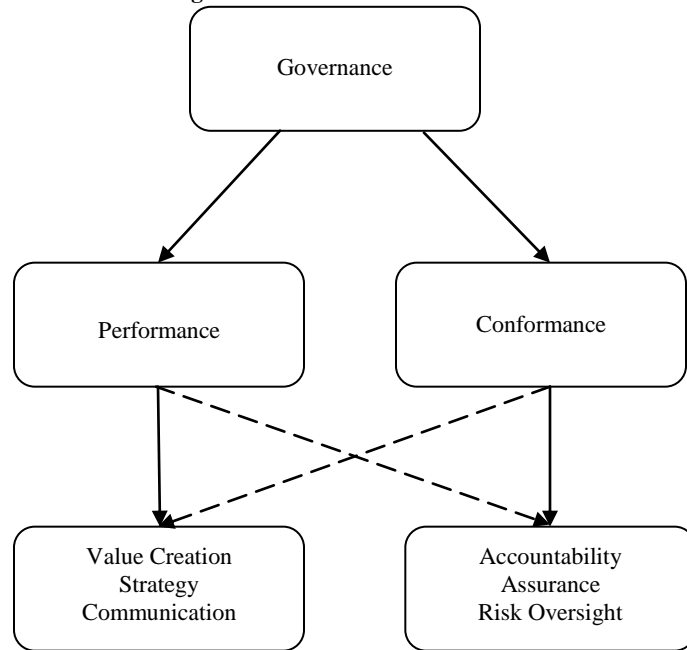
understanding of things...” Instead of striving for success using traditional models that envelop certainty, HROs appear to cherish the unknown and embrace uncertainty (Seaman and Williams, 2005). In articulating how HROs accomplish this task, Weick and Sutcliffe (2001) and Weick et al. (1999) build on the work of Langer (1989; 1997) and Rochlin (1989; 1993) in developing five processes that are mindful. Weick et al. (1999, p. 92) make clear that managing the unexpected “is fostered by an apparent ongoing focus on failure, simplification, current operations, resilience, and underspecified structures, a way of being that we refer to as mindfulness”. Furthermore, they argue (p. 92) that mindfulness is less about traditional decision making and “... more about inquiry and interpretation grounded in capabilities for action.”

Based on the above arguments, W&S explore the role of the IFAC (2009) governance framework as an enabler of the capacity for mindfulness. Specifically, the following model is examined:

$$CMIND = \alpha + \beta_1P1 + \beta_2P2 + \beta_3P3 + \beta_4C1 + \beta_5C2 + \beta_6C3 + \epsilon \tag{1}$$

where CMIND = capacity for mindfulness, and P1 = strategy, P2 = value creation, P3 = communication, C1 = accountability, C2 = assurance, and C3 = risk, following the concepts depicted in Figure I. Further analysis indicates that the level of MAS change is an important moderating variable which acts to increase the strength of the relationship between governance and mindfulness as MAS changes increase. According to W&S (p. 5), “this moderating effect is expected because MAS change pervades organizational systems and complements the expansion of ‘the action repertoire and processes of understanding, evidence collection, detection, evaluation, and revising in the sense defined by Weick et al. (1999) as well as the types of routine governance changes envisioned by the IFAC (2009) with respect to performance and conformance”.

Figure I: Governance Framework



Adapted from IFAC (2009).

REFORMULATING THE GOVERNANCE/MINDFULNESS RELATIONSHIP

Several issues emerge from the W&S study; one is related more to practice while the other is related more towards theoretical concerns. Of potential interest to managers is knowledge of whether there is a relationship

between certain governance variables and certain aspects of the cognitive processes underlying the notion of mindfulness. The W&S approach cannot deal with this question because mindfulness is treated as a single, composite variable. Therefore, mindfulness first needs to be disaggregated into its separate components. Then a multivariate canonical model can be specified in the following form:

$$\alpha_1 M1 + \alpha_2 M2 + \alpha_3 M3 + \alpha_4 M4 + \alpha_5 M5 = \beta_1 P1 + \beta_2 P2 + \beta_3 P3 + \beta_4 C1 + \beta_5 C2 + \beta_6 C3 \quad (2)$$

where M1 = preoccupation with failure, M2 = reluctance to simplify, M3 = sensitivity to operations, M4 = resilience, and M5 = deference to expertise, and the remaining variables are as defined above. Equation (2) thus decomposes mindfulness into five distinctive HRO processes associated with becoming aware of the unexpected and recovering from errors. These processes are briefly elaborated upon next.

First, people in HROs are preoccupied with failure, which means downplaying success, increasing alertness, avoiding complacency, fighting inertia and risk aversion, and searching out alternatives (Sitkin, 1992). Near misses do not imply safety but suggest potential danger (March, Sproull, and Tamuz, 1991; Landeau and Chisholm, 1995; Wildavsky, 1991). Identifying errors or mistakes is encouraged; but, more importantly, these processes are enacted swiftly and frequently (Rochlin, 1993). Secondly, HROs feature a reluctance to simplify interpretations and, instead, strive for diversity and more complexity (Perrin, 1995). They work hard at creating a culture of wariness in procedures, and in other peoples' thinking and actions, so that there is enhanced interaction and a heightened capability to notice more (Roth, 1997; Xiao, Milgram, and Doyle, 1997). Thirdly, HROs tend to be highly sensitive to operations or having the "big picture" in the moment – a concept that Roberts and Rousseau (1989) refer to as "having the bubble". They accomplish this dense picture of the current situation by continuously sharing real time information, shifting problems toward expertise, avoiding the conventional hierarchy, and engaging in nearly constant face-to-face communication (Weick, 1993; Roberts, Stout, and Halpern, 1994).

Fourthly, equally forceful in HROs is the idea of mindful containment, or capabilities for resilience: "To be resilient is to be mindful about errors that have already occurred and to correct them before they worsen and cause more serious harm" (Weick and Sutcliff, 2001, p. 67). Finally, resilience is not just about moving on from failure but, also, manifesting the capacity to cope and manage surprises in the moment: "People are willing to begin treating an anomaly even before they have made a full diagnosis" (Weick and Sutcliff, 2001, p. 69). This happens by allowing the expertise residing in diverse people to dominate the normal authority structure – in times of crises or failure, experience and expertise become more important than rank (Weick, 1979; Wildavsky, 1991). Deference to expertise, therefore, is about containment, survival, and recovery in ways that bring solutions together quickly through a flexible decision-making structure and improvisation (Weick, 1993).

Adopting a multivariate approach subsumes that there may be interaction effects among the variables comprising mindfulness as well as those comprising governance. Conceptually, the IFAC (2009) framework supports this possibility. A crucial feature embedded in Figure I is the cross impact of each dimension, manifested by the dotted arrows. Thus, the conformance dimension is presumed to affect activities in the performance dimension and vice versa which, in modeling terms, points to the need to capture interaction effects among all activities included in the framework, and not simply main effects as modeled in W&S. The HRO literature also supports interaction effects overarching mindfulness. For example, Weick et al. (1999, p. 88) (emphasis added) argue that to fully understand the concept of mindfulness "one needs to look more closely at the ways ... stable cognitive processes *interrelate*..." and "are tied together by their *joint capability* to induce a rich awareness of discriminatory detail..." Also, Van Den Eede, Van de Walle, and Rutkowski (2006, p. 4) (emphasis added) state that "... the term mindfulness is used to denote the many ways that different cognitive processes *interact* to create knowledge". Hence, there appears to be some justification for using a statistical technique that simultaneously relates the set of governance variables and the set of mindfulness variables while controlling for possible interaction effects in each set.

Another issue that surfaces in the W&S study rests with the nature of MAS change as a moderating variable on the governance/mindfulness relationship. Borrowing from the management accounting literature (Libby and Waterhouse, 1996; Williams and Seaman; 2001, 2002; Seaman and Williams, 2006), W&S utilize an aggregate measure of MAS change that captures five different sub-systems, namely, planning, controlling, costing, directing, and decision making. A significant relationship between governance and mindfulness is shown to exist at low levels

of MAS change, and it is significantly stronger under high levels of MAS change. However, a much richer set of information could be offered to practitioners and researchers if equation (2) is conditioned by the separate moderating effects of each sub-component of MAS change. Under the sub-category of planning for example, the question arises ‘is there a dominant pattern of governance and mindfulness variables for low/high levels of change’? Is this pattern the same or different over both levels of change? Furthermore, are these patterns varied or simply isomorphic across all the sub-categories of MAS change?

Developing answers to these questions forms the essence of the present paper. We first test the hypothesis that there is a significant statistical relationship between the set of governance variables and the set of mindfulness variables for: the total sample; low/high levels of planning; low/high levels of control; low/high levels of costing; low/high levels of directing; and low/high levels of decision making. Second, if significant canonical relationships emerge, the coefficients are then analyzed to determine their importance in the relationship. Given the absence of any theory in this context, it is not possible *a priori* to hypothesize the nature of any emergent patterns of variables. This constraint is addressed more fully in the next section.

RESEARCH METHOD

Sample and Measures

The profile of the sample firms and detailed sampling procedures used in this study are identical to those employed in W&S, who created a useable sample of 124 responses from registered members of the Society of Management Accountants of Canada. Six scales were adapted from guidelines published by the Governance Institute of Canada to create the performance and conformance variables. Factor analysis of the items in each scale yielded one factor with eigenvalues exceeding 1 in each case, thus confirming the single-factor structure of each scale. The variance explained in the factor analysis for each variable ranged from 71 percent to 95 percent of the total variation (see Table I), well within behavioral research standards (Levine, 1977).

Table I
Scale and Descriptive Statistics (n = 124)

Variable	Factor Eigenvalue	Variance (%) Explained	Mean	Standard Deviation	Theoretical Range	Actual Range
1. PWF (M1)	2.16	0.61	2.93	0.70	1-5	1.50-4.50
2. RTS (M2)	2.20	0.73	3.44	0.82	1-5	1.00-5.00
3. STO (M3)	2.68	0.67	3.87	0.72	1-5	1.50-5.00
4. CTR (M4)	2.07	0.63	3.22	0.76	1-5	1.25-4.75
5. DTE (M5)	2.02	0.68	3.63	0.75	1-5	1.33-5.00
6. STR (P1)	2.56	0.85	3.59	1.16	1-5	1-5
7. COM (P2)	2.20	0.74	2.72	1.22	1-5	1-5
8. VC (P3)	2.13	0.71	3.64	0.99	1-5	1-5
9. ACCT (C1)	2.16	0.72	4.24	0.90	1-5	1-5
10. ASSU (C2)	1.91	0.95	2.93	1.39	1-5	1-5
11. RISK (C3)	1.86	0.92	3.23	1.31	1-5	1-5
12. MASC	n/a	n/a	25.21	28.75	n/a	0-132

Variable definitions: PWF = preoccupation with failure; RST = reluctance to simplify; STO = sensitivity to operations; CTR = commitment to resilience; DTE = deference to expertise; MASC = total management accounting system changes; STR = strategy; COM = communication; VC = value creation; ACCT = accountability; ASSU = assurance; RISK = risk.

Following Weick and Sutcliffe (2001, 2007), five scales were developed to measure the distinct processes underlying the concept of mindfulness and then subjected to factor analysis. One factor with an eigenvalue greater than 1 emerged for each scale (see Table I), thus verifying the single-factor structure in each case. Again, the variation explained in the factor analysis for each variable is within acceptable norms, ranging from 61 percent to 73 percent (see Table I). Finally, Cronbach’s (1951) alpha statistic was utilized to calculate reliability coefficients for all the above variables. Overall, these coefficients (see Table II) are quite strong, ranging from 0.67 to 0.95, and clearly satisfy Nunnally’s (1967) inter-item reliability standard for exploratory research.

The measure of MAS change for the five sub-systems of planning, controlling, costing, directing, and decision making were taken directly from the scale developed by Libby and Waterhouse (1996). For each subsystem, a tercile split was performed and the middle group was excluded, thus producing a low MAS change group and a high MAS change group for hypothesis testing purposes. This procedure is common in the behavioral research literature (Sorrentino and Short, 1977) and serves to better delineate the low and high MAS change groups, thus capitalizing on the sample's heterogeneity.¹ Although not reported, t-tests confirmed that the two low/high sub-samples in each of the five MAS sub-systems are significantly different statistically.

Design

Canonical correlation analysis, which searches for the relationship between two sets of variables taken together rather than between individual variables from each set, is particularly well-suited to the hypothesis and research questions raised in the previous section. In the present study, canonical correlation analysis is used to examine the relationship between the governance variables as a set of independent variables (called the predictor set) and the mindfulness variables as a set of dependent variables (called the criterion set) for the total sample, and for each sub-category of MAS changes (see Eq. (2)). This simultaneous analysis of the data matrix comprising both sets permits crucial aspects of the relationship to be examined that otherwise seem intractable (Hair, Anderson, and Tatham, 1987).

Canonical analysis does this by yielding information about the number of statistically significant links between each set and the nature of the patterns of interdependency of the two sets (Levine, 1977; Sparkes and Tucker, 1971). Initially, therefore, canonical analysis generates linear functions (variates) from each set of variables which maximally correlate with each other ($R_c = 1$). Similar to normal regression analysis, if a significant relationship in the data does not emerge at this stage the analysis is then truncated. Stated differently, the coefficients associated with each variable in the relationship cannot be interpreted unless there is a significant statistical relationship (Levine, 1977).

The standardized canonical correlation coefficients (weights) of the dependent function therefore represent the marginal impact of the independent function after controlling for all other variables in the equation. In a similar manner, canonical coefficients of the independent function represent the marginal impact on the dependent function after simultaneously controlling for all other variables in the equation. An examination of the standardized canonical coefficients (i.e., weights) can thus provide an interpretation of how important each governance and mindfulness variable is in obtaining the canonical correlation coefficient in each equation. The magnitude of the weight indicates the relative importance of a variable from one set with regard to the other set in obtaining a maximum correlation between the sets. However, individual weights cannot be compared across sets.

Since these variables are standardized in the SPSS-x program (that is, variables are converted to Z-scores for analysis), these weights are analogous to standardized beta coefficients in regression analysis and, so, each individual weight represents the importance of that variable in relation to the other set of variables viewed simultaneously. Coefficients which are close to zero are unimportant in the relationship regardless of their sign whereas relatively larger coefficients strengthen the overall relationship.² Based on the literature, we interpret only those variables with weights that exceed plus or minus 0.40 (Levine, 1977).

FINDINGS AND IMPLICATIONS

Descriptive Statistics

Table I summarizes the eigenvalues and the percentage of the variance retained that were generated by the factor analysis in producing the six governance variables and five mindfulness processes used in the study. In addition, the means, standard deviations, theoretical, and actual ranges for all variables are displayed. Table II presents the Pearson correlation matrix for the measured variables and reliability coefficients. There are modest correlations within the set of governance variables and within the set of mindfulness variables, as expected, since they are both derived from a more complex, general construct.³ However, it is worth noting that no dominant patterns of relationships are visible in comparing any of the individual correlations for these two sets of variables,

which supports the rationale for applying a canonical correlation analysis to the data. Finally, there are no significant correlations between the MAS change variable in aggregate and any of the canonical correlation variables, thus satisfying an important theoretical property underlying its use as a moderating variable (Shields and Shields, 1998).

Table II: Pearson Correlation Matrix (n = 124)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. PWF (M1)	0.67											
2. RST (M2)	0.56**	0.82										
3. STO (M3)	0.43**	0.55**	0.83									
4. CTR (M4)	0.53**	0.64**	0.68**	0.69								
5. DTE (M5)	0.56**	0.70**	0.71**	0.63**	0.74							
6. MASC	0.03	0.029	0.02	0.06	0.02	n/a						
7. STR (P1)	0.31*	0.44**	0.33*	.42**	0.45**	0.01	0.91					
8. COM (P2)	0.41**	0.39*	0.25*	0.39*	0.40**	0.07	0.65**	0.81				
9. VC (P3)	0.36*	0.53**	0.53**	0.71**	0.52**	0.02	0.47**	0.35*	0.79			
10. ACCT (C1)	0.15	0.28*	0.27*	0.22*	0.30*	0.04	0.44**	0.37*	0.34*	0.80		
11. ASSU (C2)	0.38*	0.46**	0.34*	0.49**	0.43**	0.04	0.63**	0.55**	0.48**	0.41**	0.95	
12. RISK (C3)	0.27*	0.35*	0.31*	0.33*	0.39*	-0.05	0.69**	0.59**	0.39*	0.54**	0.60**	0.92

Variable definitions: PWF = preoccupation with failure; RST = reluctance to simplify; STO = sensitivity to operations; CTR = commitment to resilience; DTE = deference to expertise; MASC = total management accounting system changes; STR = strategy; COM = communication; VC = value creation; ACCT = accountability; ASSU = assurance; RISK = risk.

* < 0.05

** < 0.01

Numbers along the diagonal are calculated reliability coefficients (Cronbach, 1951).

Canonical Correlation Results

Results of the canonical correlation analysis are summarized in Table III. One significant function ($R_c = 0.758$; $p < 0.001$) appears for the total sample of MAS change, explaining 86.4 percent of the total variance. For ‘costing’ changes, one significant function emerges for both the low sub-sample ($R_c = 0.847$; $p < 0.001$) and high sub-sample ($R_c = 0.885$; $p < 0.001$), explaining 85.6 percent and 76.6 percent of the total variance, respectively. Similarly, one significant function occurs for both the low-sub-sample ($R_c = 0.759$; $p < 0.009$) and high sub-sample ($R_c = 0.842$; $p < 0.001$) under ‘controlling’ changes that explains 73.9 percent and 82.7 percent of the total variance, respectively.

The remaining three sub-categories of MAS change, planning, directing, and decision making, each yield multiple root solutions and all of them are associated with the high sub-samples. In the case of ‘planning’ changes, one significant function emerges for the low sub-sample ($R_c = 0.814$; $p < 0.021$), explaining 68.7 percent of the total variance. However, two significant roots occur for the high sub-sample (1st root $R_c = 0.754$, $p < 0.001$; 2nd root $R_c = 0.671$, $p < 0.005$), with a total variance explained of 50.5 and 31.5, respectively. Collectively, the two roots account for 82.0 percent of the total variance.

For ‘directing’ changes, one significant function appears for the low sub-sample ($R_c = 0.777$; $p < 0.002$), explaining 73 percent of the total variance, while two significant functions emerge for the high sub-sample (1st root $R_c = 0.769$, $p < 0.001$; 2nd root $R_c = 0.180$, $p < 0.009$) that explain 76.9 percent and 18.0 percent of the total variance, respectively. Taken together, both roots account for 84.9 percent of the total variance. Finally, there is one significant function under ‘decision making’ changes for the low sub-sample ($R_c = 0.696$; $p < 0.039$) and two for the high sub-sample (1st root $R_c = 0.818$, $p < 0.001$; 2nd root $R_c = 0.663$, $p < 0.010$), which together explain 85.2 percent of the total variance.

Table III: Canonical Correlation Results

Variable	Standardized Canonical Coefficients						
	Total Sample	Planning Changes			Directing Changes		
		Low	High (1 st root)	High (2 nd root)	Low	High (1 st root)	High (2 nd root)
Criterion set:							
Preoccupation with failure (M1)	-0.03	0.04	-0.16	0.70	0.32	-0.09	-0.33
Reluctance to simplify (M2)	0.16	0.22	-0.09	-1.54	-0.16	0.04	1.53
Sensitivity to operations (M3)	-0.04	-0.48	-0.41	-0.36	-0.60	0.29	-0.47
Commitment to resilience (M4)	0.79	0.93	0.74	1.02	1.03	0.65	-0.77
Deference to expertise (M5)	0.21	0.30	0.07	0.35	0.21	0.15	0.14
Predictor set:							
Strategy (P1)	0.03	0.31	0.48	-0.26	0.60	-0.42	1.39
Communication (P2)	0.19	0.12	0.44	0.54	0.03	0.28	-0.66
Value creation (P3)	0.79	0.64	0.96	-0.18	0.88	0.90	-0.79
Accountability (C1)	-0.08	0.12	0.46	-0.25	-0.13	-0.02	-0.27
Assurance (C2)	0.24	0.40	0.51	-0.05	-0.16	0.25	-0.42
Risk (C3)	-0.05	-0.19	0.52	0.11	-0.06	0.06	0.17
Sample size	124	33	47	47	48	32	32
Canonical r	0.758	0.814	0.754	0.671	0.777	0.919	0.761
Wilks lamda	0.353	0.156	0.158	0.367	0.243	0.033	0.217
Probability	0.001	0.021	0.001	0.005	0.002	0.001	0.009
Eigenvalue	1.325	1.966	1.317	0.821	1.527	5.484	1.377
% variance explained	86.4	68.7	50.5	31.5	73.0	76.9	18.0
Standardized Canonical Coefficients							
Variable	Decision Making Changes			Costing Changes		Controlling Changes	
	Low	High (1 st root)	High (2 nd root)	Low	High	Low	High
Criterion set:							
Preoccupation with failure (M1)	0.03	-0.16	-0.77	0.01	0.15	0.03	-0.10
Reluctance to simplify (M2)	0.27	0.44	0.93	0.17	0.50	0.19	0.12
Sensitivity to operations (M3)	-0.29	0.11	0.64	-0.26	0.32	-0.13	0.40
Commitment to resilience (M4)	0.89	0.69	-0.64	0.73	0.31	0.94	0.70
Deference to expertise (M5)	0.16	-0.09	0.53	0.40	-0.02	-0.01	-0.01
Predictor set:							
Strategy (P1)	0.04	0.18	0.08	0.40	-0.23	0.28	-0.34
Communication (P2)	0.20	-0.10	-1.31	-0.07	0.67	0.04	0.40
Value creation (P3)	0.89	0.61	0.20	0.71	0.65	0.75	0.91
Accountability (C1)	-0.03	0.06	0.05	-0.16	-0.04	-0.02	-0.09
Assurance (C2)	0.09	0.41	0.43	0.24	-0.05	0.25	0.21
Risk (C3)	0.01	0.14	0.20	-0.01	0.11	-0.10	0.03
Sample size	50	35	35	53	38	47	46
Canonical r	0.696	0.818	0.663	0.847	0.885	0.759	0.842
Wilks lamda	0.349	0.119	0.360	0.189	0.089	0.276	0.185
Probability	0.039	0.001	0.010	0.001	0.001	0.009	0.001
Eigenvalue	0.941	2.028	0.784	2.557	3.601	1.845	2.43
% variance explained	68.7	61.4	23.8	85.6	76.6	73.9	82.7

On balance, the correlations (i.e., Rc) for the sets of governance and mindfulness variables for the total sample and all MAS change sub-categories are remarkably high, ranging from 0.663 to 0.919. Collectively, these canonical findings strongly support the research hypotheses outlined earlier, namely, that there is a significant relationship between the set of governance variables and the set of mindfulness variables for all the MAS change categories examined.⁴

Emergent Patterns among the Canonical Coefficients

The advantage of analyzing the many-to-many patterns of association through the canonical correlation approach, in contrast to the one-to-many patterns that emerge from normal regression analysis, rests with the potential for discovering a richer model of holistic relationships that are otherwise hidden in the data. The highlighted standardized canonical weights in Table III reveal the most important variables emerging from the canonical analysis, where a positive weight signifies a heavy ‘emphasis’ or ‘importance’ attributed to a particular variable whereas a negative weight signifies a heavy ‘de-emphasis’ attached to a particular variable.

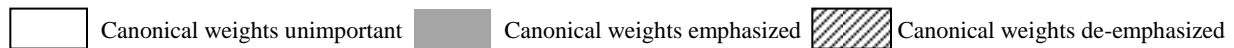
For example, the weights under the ‘total sample’ column can be interpreted in the following manner: commitment to resilience (M4) is the mindfulness variable that is most positively influenced by the set of governance variables. Alternatively, value creation (P3) is the governance variable most positively influenced by the set of mindfulness variables. All the remaining variables are essentially unimportant to the overall relationship since their loadings are less than the threshold of 0.40. So, the ‘gestalt’ or pattern that emerges for the total sample features an emphasis on value creation and commitment to resilience with respect to the total set of MAS changes. However, different patterns emerge for the sub-categories of MAS changes and these are detailed below. Following an approach similar to Levine (1977, p. 26), the canonical weights in Table III are recast into a matrix format in Figure II to render the composition of the emergent clusters more tractable and visible: the blank cells reflect variables that are unimportant in the governance/mindfulness relationship; the contoured cells reflect variables that are highly ‘de-emphasized’; and, the shaded cells reflect variables that are highly ‘emphasized’.

Figure II: Significant Patterns from Canonical Weights

Variable	Total Sample	Planning			Directing			Decision Making			Costing		Controlling	
		Low	High	High	Low	High	High	Low	High	High	Low	High	Low	High
	(1)	(2)	R1 (3)	R2 (4)	(5)	R1 (6)	R2 (7)	(8)	R1 (9)	R2 (10)	(11)	(12)	(13)	(14)
M1														
M2														
M3														
M4														
M5														
P1														
P2														
P3														
C1														
C2														
C3														

Definitions: R1 = Root 1 (1st function); R2 = Root 2 (2nd function).

Variable definitions: M1 = preoccupation with failure; M2 = reluctance to simplify; M3 = sensitivity to operations; M4 = commitment to resilience; M5 = deference to expertise; P1 = strategy; P2 = communication; P3 = value creation; C1 = accountability; C2 = assurance; C3 = risk.


 Canonical weights unimportant Canonical weights emphasized Canonical weights de-emphasized

(i) Planning Changes: Column 3 of Figure II reveals a pattern of increasing value creation (P3) and assurance (C2) associated with an increasing commitment to resilience (M4) in the context of low levels of planning changes. For high levels of planning changes two distinct patterns *simultaneously* emerge due to the existence of two significant canonical functions. Column 4 features a pattern of increases in all the governance variables linked to an increasing commitment to resilience while a second pattern (see column 5) concentrates on increasing communication (P2) driven by an increasing commitment to resilience and more preoccupation to failure (M1). These configurations have direct implications for practicing accountants given their recurring involvement in the planning process as a significant driver of value to stakeholders, and their role of expanding or implementing new planning systems to handle changing environmental uncertainties. It is noteworthy that sensitivity to operations (M3) is deemphasized for both low planning and the first high planning root while reluctance to simplify (M2) is deemphasized in the second high planning root.

For example, Wildavsky (1991, p. 221) aptly explains that resilience is more than just bouncing back or recovering from error. It also represents the capacity to “utilize change that is absorbed”. What seems to happen is that the best HROs ready themselves for surprises “by expanding general knowledge and technical facility, and generalized command over resources”. Although the language is different, this is exactly what the professional accountant aspires to communicate to various stakeholders in developing comprehensive budgets of a strategic, capital or operational nature and analyzing variances on a continuing basis, using new information to readjust budgets, and improvising on limited resources when necessary. Weick et al. (1999, p. 100-101) suggest that traditional organizations tend to favor only “anticipation of expected surprises, risk aversion, and planned defenses against foreseeable risks” whereas the better HROs enlarge the action repertoire, which has the additional advantage of creating “the capability to recombine actions already in their repertoire into novel combinations.” Following Jervis (1976) and Weick (1988), with an enlarged range of action goes a larger range of perception of new threats. Thus, the generalized capacity of accounting planning systems to support the IFAC (2009) governance framework through mindfulness processes appears to be accommodated by low levels of planning changes and enhanced even further under conditions of high levels of planning changes.

(ii) Directing Changes: Column 6 of Figure II depicts a configuration of increasing value creation (P3) and strategy (P1) associated with an increasing commitment to resilience (M4) in combination with a decrease in sensitivity of operations (M1) under low levels of directing changes. It is worth noting that directing changes specifically involve the design of reward systems and pay packages by the practicing accountant, and these activities can be viewed, not as an input, but rather as a product of the governance process itself. The use of accounting-based performance measures in managerial compensation contracts possibly represents the best known and most widely researched governance role of accounting information.

The two patterns that simultaneously emerge under high levels of directing changes appear to overlap the governance/mindfulness variables that are important under low levels but are more select in their emphasis. For example, the arrangement in column 7 shows increasing value creation (P3) and decreasing strategy (P1) matched with increasing resilience (M4). On the other hand, the pattern in column 8 stresses higher strategy (P1) linked with higher reluctance to simplify (M2) but accompanied by decreasing magnitudes of sensitivity to operations (M3), commitment to resilience (M4), communication (P2), value creation (P3), and assurance (C2). This pattern suggests that high levels of change pertaining to bonuses and rewards is compatible with increases in the performance dimension of governance and increases in mindfulness processes encompassing resilience but not compromising on simplification.

(iii) Decision Making Changes: Column 9 of Figure II shows a very compressed pattern under low decision making changes, involving only the positive association between commitment to resilience (M4) and value creation (P3). However, two patterns emerge in conjunction with high levels of decision making changes (see columns 10 and 11) that are extremely robust in the governance/mindfulness relationship. They encompass all the dimensions of mindfulness and capture both the performance and conformance dimensions of governance. Recalling that decision making changes encompass design issues such as the frequency of reported information, supplying more broad-based information to stakeholders, and reporting nonfinancial measures, these emergent patterns would appear to have direct implications for accountants in practice.

Low levels of decision making changes apparently limit the extent to which the repertoire of governance routines can combine with processes of mindfulness. No doubt the nature of the organization, the complexity of the environment that it faces, and the capacity of the current accounting reporting system determine what information content can be absorbed under these conditions. For better effectiveness, the IFAC (2009) states that sufficient resources should be devoted to external reporting (p. 14), to implementing processes and procedures that provide both performance and conformance oversight (p. 16), and to support an organization's disclosures, "including financial and non-financial disclosures" (p. 18). A context of high levels of decision making changes appears to offer this capability. Moreover, by designing a larger base of reporting systems, practicing accountants can generate a larger set of quantitative data covering more business problems and issues, and more frequently. As Weick et al. (1999, p. 115) recognize "... systematic and continual attention to fact-based analysis heightens awareness of potential and existing errors". The mindfulness processes depicted in columns 10 and 11 reflect this type of advantage.

(iv) Costing Changes: Low levels of costing changes support mindfulness processes exclusively aimed at the organization's capacity to recover from unanticipated errors after they are discovered, namely, commitment to resilience (M4) and deference to expertise (M5), and the performance dimension of governance, namely, value creation (P3) and strategy (P1). This pattern, shown in column 12 of Figure II, is remarkably similar to the pattern which emerges for low levels of directing changes (see column 5) and has potential implications for the practicing accountant. Recall that directing changes encompass the design of reward and compensation systems (including accounting-based compensation contracts) which, in turn, provide an important source of information to governance mechanisms that monitor basic agency problems in the organization such as audit committees, risk committees, and even the board of directors. Enhancing effectiveness in this domain of accounting necessarily draws on the reliable monitoring of cost inputs that are allocated to various divisions, projects, and managers in determining performance-reward outcomes. Thus, to reap the full benefits of effectiveness in the governance/mindfulness relationship, practicing accountants need to understand that it may be imperative to align the level of change in directing systems with the same level of change in costing systems.

High levels of costing changes (see column 13) support the performance dimension in the governance framework, particularly value creation (P3) and communication (P1), with corresponding increases in mindfulness processes that counter tendencies to simplify (M2). Knowledge of this pattern could remind the practicing accountant that allocating resources effectively in a volatile and continuously changing environment requires commensurate changes to costing systems. And, to the extent that this necessitates more costing changes, this action reinforces an important input to the governance processes of value creation and communication, and forestalls behaviors that "allow anomalies to accumulate, intuitions to be disregarded, and undesired consequences to grow more serious" (Weick et. al, 1999, p. 94).

(v) Controlling Changes: Column 14 of Figure II shows that low levels of controlling changes are consistent with increasing value creation (P3) and increasing resilience (M4), a pattern that replicates the one that emerges for low levels of decision making changes. This linkage corresponds with the IFAC (2009, p. 15) guideline stating that an organization's understanding of its business model and how to create and optimize shareholder value requires "a performance measurement process that measures competence and achievements in *critical areas*" (emphasis added). Value creation expands the repertoire of effective governance routines in critical areas by definition and this activity is associated with a higher commitment to resilience. Also, recall that controlling changes engage the practicing accountant in measuring a broad spectrum of performance, from individuals to the firm, and even to external stakeholders such as customers. Thus, low levels of controlling changes seem sufficient to support this governance/mindfulness pattern.

The pattern that emerges for high levels of controlling changes overlaps, and therefore completely supports, the pattern formed for low levels of controlling changes. However, it expands the performance dimension of governance to include communication (P2) and mindfulness processes that enhance sensitivity to operations. The IFAC (2009, p. 15) documents that the pursuit of value creation in the performance dimension demands an understanding "... of how the organization operates, and the opportunities and risks inherent in the environment in which it operates." Clearly, more communication is commensurate with good governance. Also, HROs curb the tendency to simplify by cultivating requisite variety through a divergence in analytical perspectives among managers (Schulman, 1993), creating redundancy through cross checks (Landau, 1969), or producing skepticism or

doubt in procedures (Bierly and Spender, 1995), all of which demand more performance mechanisms, not less. This suggests the need for multiple accounting-based performance measures, which the practicing accountant can harness through designing higher levels of controlling changes.

CONCLUDING COMMENTS AND FUTURE RESEARCH

The purpose of this study was, first, to investigate whether the governance dimensions of performance and conformance are associated with components of mindfulness, and then to explore the moderating effects of change in different MAS on these potential relationships. Canonical correlation analysis was particularly well-suited in this case because it searches for the relationship between two sets of variables taken together, rather than between individual variables from each set (Sparks and Tucker, 1971; Levine, 1977; Macintosh and Williams, 1992; Williams and Seaman, 2003). This approach was theoretically appealing because it permits the bridging of synergies offered by two seemingly paradoxical literatures that overarch the pursuit of improved corporate effectiveness. On the one hand, the IFAC (2009) adopts a ‘best practices’ framework premised on changing routines and processes that promote *success*. On the other hand, the literature on HROs stresses an action repertoire of cognitive mindfulness processes that drive effectiveness through *failure avoidance*.

The statistical results displayed in Table III yielded 13 significant governance/mindfulness relationships emanating from the five sub-categories of MAS change, thus supporting the primary research hypothesis. These findings provided a basis for asking whether each of the MAS change sub-categories, partitioned into low and high levels, would manifest unique patterns or configurations of important variables in the governance/mindfulness linkage. Figure II was constructed from the statistical output in Table III to make this discovery more visible. The emergent patterns were found to be different in each case and, hence, this knowledge would have been masked if only the single pattern had been reported for the total sample.

These findings are illuminating in a practice context for several reasons. To begin with, the IFAC (2009, p. 9) was concerned that “company attention is dominated by compliance at the expense of strategy and performance” and pointed to its report entitled “Financial Reporting Supply Chain Survey – Current Perspectives and Directions” (IFAC, 2008) to this effect. Referring to this same report, the IFAC (2009, p. 9) commented that “The respondents also observed a checklist mentality, leading to governance in name and not spirit. Respondents recommended a move to a more *balanced approach* to conformance governance and performance governance” (emphasis added). Following Langer (1989, 1997), Rochlin, (1989), Weick et al., 1999, Weick and Sutcliffe (2001) and others in the HRO literature, W&S argued that the directives of the IFAC for better effectiveness from increased governance routines was not necessarily direct but, instead, could operate through better managing of expected and unexpected events to increase reliability. More to the point, only communication (P2), value creation (P3), and assurance (C2) were found to be significant positive determinants of the capacity for mindfulness, but the methodology adopted in the W&S study restricted any understanding of specific cognitive processes that might be involved.

However, Figure II in the present paper suggests an alternative picture – one that invokes all the performance and conformance variables put forth by the IFAC (2009) as being important in the search for better effectiveness, and in an interactive manner as displayed in Figure I. What makes this robustness in the IFAC framework visible is the decomposition of the mindfulness concept and, hence, discovering the specific impacts on the governance variables by holding the set of mindfulness variables constant across the different MAS sub-categories. In fact, the six governance variables surface as individually important in 24 cells covering the 13 patterns that are created by analyzing the different MAS change categories. Furthermore, the important governance performance variables dominate the governance conformance variables by three-fold, with 18 cells appearing under the former compared with six cells for the latter. Clearly, increasing the repertoire of governance routines advocated by the IFAC in a context that defines the professional accountant’s work in an organization seems to favor the performance dimension under conditions of MAS change. In summary, this study transcends the partial glimpse of the structure involved in the governance/mindfulness relationship that would be available from utilizing a single or multiple correlation analyses.

These findings also suggest potential insights for the professional accountant that might be applied in practice. Of course, this necessitates being receptive to the idea that the concept of mindfulness can be applied in

non-HROs. Originally, the concept of mindfulness was developed within the contexts of a nuclear power plant, a US air traffic control system, an electricity distribution system, and operations on a Navy aircraft carrier. Weick and Roberts (1993) referred to these examples as HROs because of their very low failure rate in an environment representing “a million accidents waiting to happen”. However, if people are serious about reliability and the consequences of failure, then they should put the latter “on the same scale as the activities being observed” (Weick, et al., 1999, p. 106). So, it is not a catastrophe to shut down an assembly line, but it is a major disaster for the foreman relative to what he expected and works every day to prevent. Accounting information systems in practice appear to be similarly vulnerable.

The professional accountant could use knowledge of the patterns reflected in Figure II in several ways. For example, if elements of the performance dimension need to be upgraded to match best practices and create the balance envisioned by the IFAC (2009) framework, the CFO could apply resources judiciously to create low rather than high levels of systems change. In doing so, the CFO would understand the specific cognitive processes that need to be emphasized, de-emphasized, or ignored. The IFAC (p. 12) also recognizes that for conformance “professional accountants in business are often responsible for meeting regulatory and reporting requirements, and developing control processes” and for performance, “are generally responsible for providing, analyzing, and interpreting information ... for formulation of strategy, planning, decision-making, and control.” The research findings here suggest how changes in management accounting systems might support the IFAC directives in practice.

The results of this study also help to de-mystify why certain governance variables, such as assurance (C2), risk (C3), and strategy (P), were not found to be significant determinants of mindfulness in the W&S study. To be sure, measurement issues are always a confounding problem in behavioral studies, including this one, but a more reasonable explanation underpinning this finding appears to rest in the capabilities of the research model. The use of canonical correlation analysis is justified because the complexity of attaining any sense of reliability in volatile and turbulent environments requires an equally complex response. The IFAC (2009) framework is progressive in this respect, but stresses conditions and objectives to be sought. Cognitive processes underlying mindfulness, however, are defined by conditions to be avoided (Weick et al., 1999; Weick and Sutcliffe, 2007) and this requires some degree of detail. The various systems that are crafted, applied, modified, and/or changed by the professional accountant to search out, capture, analyze, evaluate, and communicate information appear to offer the requisite variety (and detail) to understand the alignment of mindfulness processes with the performance and conformance dimensions of governance.

In concluding, these observations point to the role of MAS change as an enabler of the governance/mindfulness relationship and it means that an appealing research area is apparent here. Currently, there is simply no accounting literature which deals with the linkage of mindfulness and MAS change as a plausible alternative for increasing organizational reliability. Despite the interesting findings and possible implications for practicing accountants, the present study remains exploratory and is subject to the important caveats that accompany survey research, including common-method bias from self-reported data (Kren, 1992) and hindsight bias (Libby and Waterhouse, 1996). Also, the generation of the five mindfulness processes, and the governance variables for that matter, through factor analysis may have been spurious and accidental. Furthermore, there may be concern over the cut-off value used to determine the importance of the canonical weights even though it is on the conservative side of literature standards (Levine, 1977; Randolf and Dess, 1984). Finally, the interpretation of the patterns reflected in Figure II is admittedly tentative, given the absence of related research. Clearly, initial conditions related to the firm’s state of MAS change, including a history of these changes and any existing imbalances between the conformance and performance dimensions of governance, temper how the present findings could be used by the practicing accountant.

Future research could consider how the concept of ‘collective mindfulness’ (Weick and Roberts, 1993; Weick et al., 1999) might be introduced and managed among the various MAS change contexts and/or individually. A longitudinal design might examine how the five cognitive processes change over time with MAS change. Certainly, other samples of firms need to be analyzed to discover if this study’s findings are generalizable, and if so, in which ways. Also, more detailed contexts of the IFAC framework need to be explored within the domain of the professional accountant, such as new governance structures for risk management, new information systems to guide

audit committees, communication linkages between strategic planning and internal control, not to mention costing and directing types of systems. For sure, research effort needs to focus on possibly moving professional accountants in a tradition-bound industry more toward reliability-seeking professionals (Vogus and Welbourne, 2003). Finally, there is considerable merit in future studies that focus on the governance/mindfulness-MAS change interface within single organizations, most notably using case-type methodology similar to Carlo, Lyytinen and Boland (2004) for studying risk control in highly complex architectural design.

ENDNOTES

1. The practice of making a tercile split, and dropping the middle (moderate) third, is related to the phenomena known in psychology as the “discontinuous nature of moderates” whereby the moderates (middle group), when included in a two-level split, mask the relationship in the data (Sorrentino and Short, 1977). The reason for this is that moderates tend to be cross-situationally inconsistent with regard to characteristics under study: “By failing to account for it, the researcher is highly susceptible to Type I and Type II errors in drawing conclusions” (Sorrentino and Short, 1977, p. 483).
2. It is important to note that these coefficients are not *correlation* coefficients and so their theoretical range is *not* constrained to plus or minus one. The SPSS-x program which we employed standardizes (i.e. zero mean and unit variance) all of the raw input variables and constrains the standardized canonical coefficients to a range of -99 to +99 which is deemed to be extremely generous.
3. As noted, there is modest correlation among the mindfulness variables because the single conceptual construct of mindfulness is multidimensional (Weick et al., 1999; Weick and Sutcliff, 2001, 2007). There is even less correlation among the governance variables, which also are derived from an overall construct of governance which features the multiple dimensions of performance and conformance (IFAC, 2009). Overall, the correlation structure is very stable and shows only one negative correlation.
4. Each separate canonical analysis was subjected to two statistical checks. First, there may be concerns that the ordinal data produced by the Likert-type scales used in this study violate the normality assumption associated with parametric MANOVA statistical tests. In addition, the sub-sample sizes arguably border on the theoretically appropriate minimum. Thus, a multivariate Kruskal-Wallis non-parametric test (Katz and McSweeney, 1980) was performed on all the data and no qualitative differences emerged in any of the reported significance levels. Secondly, since the canonical weights are subject to instability (Cooley and Lohnes, 1971), it is suggested that the canonical structure coefficients (the relation between the original variables and the canonical variates to which they contribute) should also be examined. An examination of the canonical structure loadings for each test revealed no significant reversals of signs relative to the canonical weights.

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