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ABSTRACT

As an exploratory study we apply the concept of mindfulness to examine the moderating influence of cognitive processes of top management on the relationship between its support for the IS function and the overall IS function performance. In doing so we enhance our understanding of the underlying cognitive processes associated with top management in their support toward the IS function. We trace the origins of mindfulness in the psychology area to its final possible assimilation in IS research. We then broaden the potential application of collective mindfulness in IS research and embark on developing a scale of collective mindfulness in the IS context. Examination of such possible moderating influences in the context of top management support and IS performance may open doors for future, much deeper, integration of mindfulness in IS research and may help both research and practice in the continued quest for achieving reliable performance of IS.

Keywords

Collective mindfulness, top management support, IS function performance.

INTRODUCTION

The mission-critical nature of IS was highlighted during the crisis at the Tokyo Stock Exchange in late 2005 and early 2006 when trading software was unable to handle increasing trading volumes and stop erroneous trades. This failure caused millions of dollars in losses to brokerages and a drop in consumer confidence in the exchange (Gartner Research, 2006). More recently, in the U.S., a failure in computer systems containing law-enforcement records at the Los Angeles airport in 2007 caused 20,000 travelers to be stranded at the airport and outbound flights to be delayed for several hours (The Wall Street Journal, Aug 13 2007). Clearly, in dynamic and uncertain environments it is important that information systems (IS) be designed, used, and managed to contribute to reliable aggregate performance (Butler and Gray 2006). However, IS often fail to meet this objective. One key factor for such failure has been attributed to the lack of top management support to IS and considerable research has been conducted from a variety of perspectives on the nature of the impact of top management support on IS performance (Pinto and Slevin 1987; Ragu-Nathan, Apigian, Ragu-Nathan and Tu 2004; Sabherwal, Jeyaraj and Chowa 2006). Indeed, continuous involvement from top management is invaluable in resolving problems when crises and conflicts arise in uncertain environments (Pinto and Slevin 1987).

However, we know little of the mindsets of top management which can facilitate or hinder such support (Meindl, Stubbart and Porac 1994). Recently, the concept of *collective mindfulness*, which as a result of its underlying cognitive processes facilitates the discovery and correction of errors capable of escalation (Weick, Sutcliffe and Obstfeld 1999), has been introduced to IS research to help explain the organizational processes in IT innovation (Swanson and Ramiller 2004) and more broadly on achieving reliability with IS in organizations (Butler and Gray 2006).

Swanson and Ramiller (2004) call for a reexamination of top management support in the mindfulness context and remark that "*a certain strategic mindfulness is needed to attend to the disruptive effects of IT initiatives. Such a strategic mindfulness, which entails a wary concern for the firm's long-term viability, may best be placed with top management. In its absence, other forms of support, such as the provisioning of monies and people, might not suffice to enable the innovation to weather the storms of implementation and ultimately be successfully assimilated*" (p. 576). While Swanson and Ramiller were commenting specifically in relation to innovating with IT, we believe that such strategic mindfulness placed with the top management may have much broader implications for different aspects of information systems along with innovation (Swanson and Ramiller 2004), such as, decision making (Fiol and O'Connor 2003) pertaining to strategic applications of IS (Sabherwal and King 1991) and IS sourcing (Lacity and Hirschheim 1993), effective sensemaking (Seiling and Hinrichs 2005), IS operations, development, and management (Butler and Gray 2006) in organizations.

We suspect, that the application of such collective mindfulness of top management on the study of the impact of top management support on IS performance will provide considerable insight and break new ground. More specifically, we are interested in studying how the cognitive processes (as inducing collective mindfulness) associated with top management impact the top management support and IS performance relationship. In doing so, we hope to make the following contributions: 1) broadening of the scope of the application of collective mindfulness in IS research by studying its impact on overall IS performance, 2) empirically testing the possible effects of collective mindfulness for the first time, 3) development of a scale of collective mindfulness in the IS context, and 4) reconfirmation of the top management support – IS performance relationship.

To set the stage, in this study, top management support refers to the degree to which top management understands the importance of the IS function and the extent to which it is involved in IS activities (Ragu-Nathan et al. 2004 p. 461). Top management refers to CEO, CIO, COO, and other high level executives (Ragu-Nathan et al. 2004; Weill 1992). IS function refers to all IS groups and departments within the organization (Saunders and Jones 1992) and IS function performance is with respect to the systems, information and services produced by the IS function (Chang and King 2005).

As a work in progress, the rest of the paper is organized as follows. In the next section we will briefly describe the concept of mindfulness, the progression from individual mindfulness to collective mindfulness in organizations, and finally the integration of mindfulness in IS research. We then present our theoretical model and hypotheses followed by a discussion surrounding a possible assessment measure of collective mindfulness.

MINDFULNESS

Mindfulness may be viewed as a flexible state of mind in which individuals are actively engaged in the present, noticing new things, and being sensitive to context (Langer 1997; Langer 2000). At the individual level then, mindfulness is said to be characterized by openness to novelty, alertness to distinction, sensitivity to different contexts, awareness of multiple perspectives, and orientation in the present (Butler and Gray 2006; Langer 1997; Sternberg 2000). In contrast, Langer (2000) states that when individuals are in a state of mind*less*ness, they act automatically on a routine basis using preexisting categories of the past rather than creating of new categories in the present. That is, instead of actively drawing distinctions and noticing new things, individuals when they are mindless are stuck in a single, rigid perspective without any attention to alternative ways of knowing. Much of the work done with the concept of mindfulness has been at the individual level and the impact of individual mindfulness has been studied in a variety of contexts, among others, from aging and learning (Langer 1989; Langer 1992; Langer 1997; Langer, Blank and Chanowitz 1978; Levinthal and March 1993) to psychological well being (Brown and Ryan 2003).

Of late, however, the concept of mindfulness has been extended from the individual level to the collective level (group/ business unit/organizations) (Butler and Gray 2006; Swanson and Ramiller 2004; Weick and Sutcliffe 2001; Weick et al. 1999). Weick et al. (1999) introduced the concept of mindfulness at the organizational level in the context of high reliability organizations (HROs). Weick and Sutcliffe (2001, p. 42) describe collective mindfulness as "*the combination of ongoing scrutiny of existing expectations, continuous refinement and differentiation of expectations based on newer experiences, willingness and capability to invent new expectations that make sense of unprecedented events, a more nuanced appreciation of new dimensions of context that improve foresight and current functioning.*"

Collective mindfulness has to deal with a collective's ability to perceive cues, interpret them, and respond appropriately (Butler and Gray 2006). However, the attention and lively awareness is not just a matter of allocation of scarce attention resources but it is also a matter of the quality of attention. Also, mindfulness is "as much about what people do with what

they notice as it is about the activity of noticing itself" (Weick et al. 1999 p. 90). Moreover, mindfulness is not merely cognitive alertness but for true mindfulness to manifest itself such alertness must be accompanied with contextually differentiated reasoning (Swanson and Ramiller 2004). Collective mindfulness is not necessarily something which is activated by novel environmental cues but it is a *consistent mindset* prevalent in the collective that what we know is known imperfectly and all events are capable of novelty beyond what is known of them (Weick et al. 1999). This *ongoing* alertness and awareness is manifested in continuous revisiting and revision of assumptions and categories, in differentiating them, and in updating/replacing them rather than in simple one time hesitations in taking actions based on particular environmental cues (Seiling and Hinrichs 2005; Weick et al. 1999).

Swanson and Ramiller (2004) incorporated the concept of organizational mindfulness into IS research, more specifically in the context of innovating with IT. Drawing from the work of Weick and his colleagues (Weick and Sutcliffe 2001; Weick et al. 1999), Swanson and Ramiller (2004) theorized that a mindful firm will attend to an IT innovation with reasoning grounded in its own organizational facts and specifics. This is in contrast with mind*less* innovation where such grounding and attention is absent. Butler and Gray (2006) adopted a broader view of the implications of individual and collective mindfulness on reliability of IS and argued that mindfulness could be used as a theoretical foundation for explaining efforts to achieve individual and organizational reliability. Their study highlighted how applying mindfulness concepts in studies of IS design, management, operations and use can contribute to the realization of reliable work and performance outcomes in organizations (p. 212).

This paper is closer to the views of Butler and Gray (2006) in that we take a broader approach and in doing so plan to examine what mindsets of the top management are responsible for enhancing the oft mentioned relationship between a key IS variable i.e. top management support and IS function performance.

THEORETICAL FOUNDATIONS AND RESEARCH MODEL

The *state* of collective mindfulness is said to be created by at least five processes, 1) preoccupation with failure, 2) reluctance to simplify interpretations, 3) sensitivity to operations, 4) commitment to resilience, and 5) deference to expertise as a result of underspecification of structures (Butler and Gray 2006; Swanson and Ramiller 2004; Weick and Sutcliffe 2001; Weick et al. 1999).

A preoccupation with failure within a mindful organization is not an unhealthy single-minded obsession with failure but a healthy alertness and lively awareness of the possibilities of errors and failures within an organization and a treatment of such failures and near failures as indicators of the organization's health. It entails a thorough analysis of near failures and a focus on the liabilities of success (Weick et al. 1999). "Near misses" are treated as opportunities to learn and grounds for improvement. Failures are not localized, i.e. problems in one part of the organization are not treated in isolation no matter how small or trivial they may seem by themselves and instead their impact on the rest of the organization is paid careful attention to. Quiet periods marked by smooth operations are treated as an indication that perhaps signals of potential problems are being overlooked (Swanson and Ramiller 2004). An environment of openness is created and fostered which encourages and rewards self-reporting of errors, failures, and near failures. Mindful organizations realize that it is far more important that errors and possibilities of failure are out in the open so that action could be taken to fix them and avoid future occurrences, than to be able to place responsibility of such errors for merely punishment purposes (Weick et al. 1999). Overall, a focus on errors and failures can help avoid overconfidence, complacency and inattention which often creep in when success becomes routine (Butler and Gray 2006).

Reluctance to simplify interpretations entails resisting the temptation to rely on over simplifications of complexities by using routine heuristics such as world views, frameworks, or mindsets without an appreciation of the true complexity of the event at hand and without the realization that complex responses are needed in complex situations (Swanson and Ramiller 2004; Weick 1995; Weick et al. 1999). It refers to a collective desire to look at problems and events from novel, diverse and conflicting perspectives which increases the organization's chances of detecting both small and large discrepancies in a context aware manner so that such discrepancies could be dealt with in a timely and appropriate manner (Butler and Gray 2006; Swanson and Ramiller 2004). Mindful organizations induce their members to notice more and in essence focus on what they don't know instead of simply focusing on what they do know (Weick et al. 1999). In essence, such mindful reluctance to simplify moves an organization away from accepting stock or ready-made interpretations of events prevalent elsewhere and toward a more careful examination of events and phenomena based on and relevant to current organizational conditions – thereby reducing complacency and rigidity (Fiol and O'Connor 2003; Swanson and Ramiller 2004; Weick et al. 1999).

Sensitivity to operations implies that a mindful organization pays vigilant attention to each and every detail, regardless of how seemingly insignificant it may be, in day-to-day operations at a given moment (Swanson and Ramiller 2004). This reflects a realization that problems often arise in the interactions of small deviations and random events across different operational areas and present situations which were not readily anticipated in formal planning and daily routines (Butler and Gray 2006; Swanson and Ramiller 2004). Building on the work of Roth (1997) which deals with operator decision making in simulated nuclear power plant emergencies, Weick et al. (1999) maintain that sensitivity to operations is achieved through a combination of shared mental representations, collective story building, assessment of situations and continual updates of such assessments, knowledge of interconnectedness of systems, and active diagnosis of the limitations of preplanned procedures.

Commitment to resilience in a mindful organization involves a collective mindset that anticipation of expected surprises manifested in the form of risk analyses and planned defenses are inherently not complete (Swanson and Ramiller 2004; Weick et al. 1999; Wildavski 1991) and resilience as the capability to bounce back and recover from failures and to cope with surprises in the moment (Weick et al. 1999) is essential. Resilience is "a generalized capacity to investigate, to learn, and to act, without knowing in advance what one will be called to act upon" (Wildavski 1991 p. 70). A mindful organization is skeptic or at least ambivalent toward the applicability of past practice to future scenarios. It simultaneously both believes and doubts past experience in order to take the appropriate response to a hazard situation (Weick et al. 1999). Overall, an mindful organization is committed to resilience in that it favors improvisation over just a reliance on planning, adaptation over routines, and effectiveness over mere efficiency (Swanson and Ramiller 2004 p. 561).

Finally, deference to expertise in a mindful organization manifests itself in the underspecification of structures – a relaxation and departure from formal hierarchical decision structures which enables the flow of authority to people who possess the required expertise to deal with a particular problem at hand (Butler and Gray 2006; Weick et al. 1999). This allows for problems to be matched with broader, more pertinent sets of capabilities and solutions which is typically not the case in a traditional hierarchical structure. Given the focus on problems in a mindful organization when someone detects a problem and is not able to figure it out he/she turns to another who might have the relevant expertise on such a problem (Weick et al. 1999). Weick and his colleagues (1999) call this deference a "loosening of the filter of hierarchy" and observe that this eventually leads to a decoupling of problems from high ranking decision makers if they do not possess the required expertise and allows problems to migrate there by providing a wider variety of people to make sense of novel cues.

The research model is presented in figure 1.

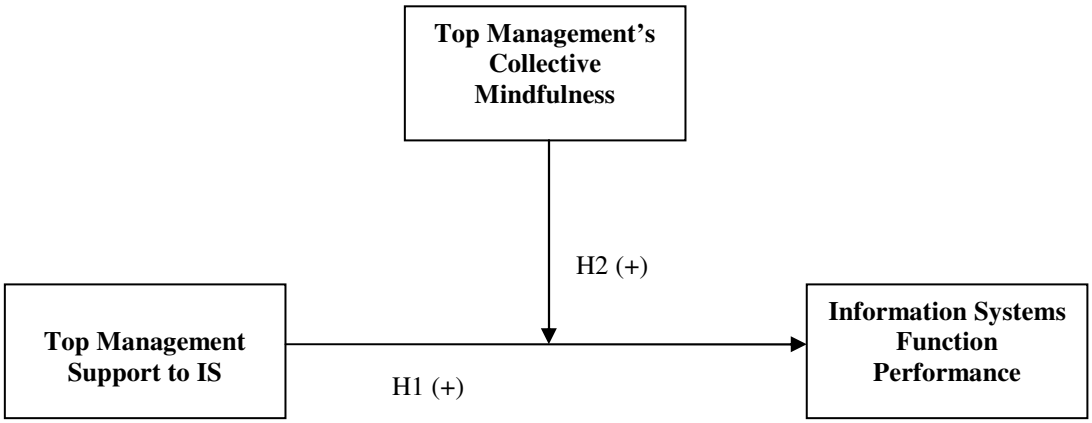

Figure 1. Research model

The Top Management Support to IS – Information Systems Function Performance Linkage

The top management support – IS performance linkage bears considerable support in prior IS literature (Doll 1985; Ragu-Nathan et al. 2004; Sabherwal et al. 2006). Top management support is a key enabler of various operational and strategic IS activities such as, among others, IS planning, negotiation, and project management (Weill 1992). Top management support was found to have an impact on successful IS planning (Ragu-Nathan and Ragu-Nathan 1988) and through allocation of

necessary resources and through creation of a supportive organizational environment to indirectly affect IS performance (Bajwa, Rai and Brennan 1998). Lack of top management support has been identified as the number one critical risk factor for the success of IS projects (Schmidt, Lyytinen, Keil and Cule 2001) and has been held to be a critical barrier to IS use (Guimaraes and Igbaria 1997). In another study which asked managers to identify key issues affecting IS success, top management support was reported to be the most important (Yang 1996). Ragu-Nathan et al. (2004) tested a model of both the direct effects of top management support on IS performance and the indirect effects through variable related to organizational positioning of IS and IS management issues. Their model provides strong support of both.

H1: Top Management Support for IS (TMS) will be positively related to Information Systems performance.

Moderating Effect of Collective Mindfulness

In terms of the processes associated with innovating, Swanson and Ramiller (2004) theorize that a mindful organization will not simply heed to the prevalent industry wide claims about the innovation's purported benefits at face value but will critically examine it in terms of the fit of such an innovation with its localized context. Such mindful consideration of the innovation instead of mindless reliance on fads and bandwagons may enable a firm to accept or reject an innovation for the right reasons. A preoccupation with failure may caution a mindful firm in simple blind acceptance of the norms which portray 'new' is necessarily better. Mindful consideration i.e. through enabling different interpretations, application of varied sets of expertise and close attention to potential problems, and a commitment to resilience may help keep a firm from premature commitment to an innovation (Swanson and Ramiller, 2004, pp 561-562). The five attributes of mindfulness may also be critical in implementation. Mindful organizations will be aware of the potential for failure in implementation, they will shun simple interpretations and be sensitive to problems of all kinds and magnitude, making sure that they are not ignored and treated as mere obstacles to be overcome in implementation. Input will be gathered from people with relevant expertise instead of a mere top down approach. While planning during implementation is critical mindful firms will be ready to make needed adjustments with a richer and context-sensitive understanding of implementation (Swanson and Ramiller, 2004, pp 562-563). Mindfulness may also prevent escalation of commitment (Sabherwal, Sein and Marakas 2003) and enable organizations to accept failure if necessary.

The onus of innovating often lies with the top management. If mindfulness can enhance innovating with IT as described above and detailed in Swanson and Ramiller (2004) it may be bound to enhance the overall effects of top management support, not just in the form of provision of resources and championship but in a mindful appreciation of innovations, on the ultimate information systems performance as a whole. In essence, top management mindfulness in innovating with IT in the face of bandwagons (Abrahamson and Rosenkopf 1993) much abound in the industry, may have implications for IS performance.

Fiol and O'Connor (2003) developed a framework for understanding the relationship between mindfulness and decision-making process in organizations and theorized that mindfulness leads to expanded scanning, which then leads to more context-relevant interpretations and ultimately affects decision making. They proposed moderating effects of varying degrees of mindfulness on scanning and interpretation related aspects of decision making. A greater reluctance of decision makers to simplify interpretations may make them more likely to attend to details based on current organizational conditions which results in them understanding the value of information for current circumstances. A greater commitment to resilience would promote thorough scanning through experimentation along the lines of what is known resulting in interpretation of unusual and unexpected results as relevant if within the bounds of firm's purpose. A greater preoccupation with both success and failure will make decision makers more likely to scan for contradictory information which makes them more likely to interpret data based on a belief that past practices may be wrong. Such greater mindfulness as emerging from the three process described by Fiol and O'Connor may result in expanded and more context relevant interpretations ultimately improving decision making.

Top management's key roles include that of decision making. Fiol and O'Connor (2003, p. 57) maintain that "to avoid bandwagon behaviors that add little or no value to a firm, it is important to enhance the accuracy of decision makers' perceptions of those behaviors and their fit with the firm's particular circumstances," and propose that mindfulness may serve that purpose. Indeed, as Seiling and Hinrichs (2005 p. 85) observe "[M]indfulness is a precondition of making appropriate sense of the current environment, which leads to good decisions and taking responsible, productive, and accountable action." Top management must often decide on development of IS applications that may provide strategic benefits given the increasingly strategic potential of information systems (Sabherwal and King 1995). The growing importance of decisions

pertaining to sourcing of information systems in the face of bandwagons related to IS sourcing is another key set of decisions top management often contends with (Lacity and Hirschheim 1993). A mindful top management making such sensitive "make or break" decisions may be critical to the overall IS performance.

In terms of IS operations, collective mindfulness theory suggests that abstract plans or strategies by themselves may not be enough to achieve reliable performance but instead an ongoing focus on operations may be the key (Butler and Gray 2006; Weick and Sutcliffe 2001). Achievement of such an ongoing focus on operations could strongly depend on how the IS function is organized and managed, both of which fall under the purview of top management. The structures and practices followed in an organization with regard to the IS function underlie an organization's ability to make effective use of information technologies (Butler and Gray 2006). With respect to IS development projects top management's collective mindfulness may also have serious impacts. For example, are systems development methodologies being mindlessly adapted based on bandwagons without regard to their local implications. Similarly, with regard to potential risks and problems associated with development, the anticipation of generalized risks and stock ways of dealing with them may not be enough. Instead, managerial mindfulness with its attention to operational details, for quick identification of problems, and flexible structures, so that problems are moved to people with expertise, may be key to achieving reliable performance (Butler and Gray 2006). Based on the observations and arguments above we posit that,

> **H2**: Collective Mindfulness moderates the relationship between Top Management Support and Information Systems Performance so that Top Management Support is more positively related to Information Systems Performance for top management with high Collective Mindfulness

METHOD

This research proposes to use a survey methodology to test the hypotheses. Top Management Support and Information Systems Performance measures will be adapted from Ragu-Nathan et al. (2004) each containing 7 and 5 items respectively.

Although there exists an individual level dispositional scale of mindfulness called the Mindful Attention Awareness Scale (MAAS) (Brown and Ryan 2003) measuring the subjective experience of mindfulness as present attention and awareness, we are not able to use it by the process of aggregation – neither by the direct consensus nor by the referent-shift models methods (DeShon, Kozlowski, Schmidt, Milner and Wiechmann 2004), commonly used to justify aggregation. Collective mindfulness is not simply the result of having individually mindful personnel (Butler and Gray 2006). Collective mindfulness is "an organizational property grounded in, although not reducible to, the minds of participating individuals through a process of heedful interrelating" (Swanson and Ramiller, 2004 p. 555 quoting Weick and Roberts, 1993). One way to look for the presence of collective mindfulness (here within the top management) may be then, to examine the evidence for the presence of the five processes that lead to collective mindfulness (Fiol and O'Connor 2003; Swanson and Ramiller 2004; Weick and Sutcliffe 2001). Weick and Sutcliffe (2001, Chapter 4) provide an instrument for assessing organizational mindfulness based on the five attributes of collective mindfulness but this instrument takes a broad view of collective mindfulness and may not fit the context of this study. Swanson and Ramiller (2004) observe that given the complexities in the organizational processes measurement approaches of collective mindfulness need to be tailored carefully to particular studies. Therefore we draw heavily on Swanson and Ramiller's (2004) adaptation of collective mindfulness in IS research while broadening the focus from innovating to include the overall IS function in developing a measure for collective mindfulness in IS context.

CONCLUSION

The concept of collective mindfulness has received recent attention in IS research. We apply collective mindfulness in our study to examine the impact of the cognitive processes associated with top management on its support to IS and overall IS functional performance. By examining such an overall impact of collective mindfulness we wish to take an exploratory step toward future, much deeper, integration of collective and individual mindfulness in IS research as has been called for by scholars such as Swanson and Ramiller (2004) and Butler and Gray (2006). Future studies may tease out any potential direct or interaction effects of individual and collective mindfulness on smaller sub-sets of IS criteria across various domains in IS research. Our efforts at developing a scale of collective mindfulness in IS contexts should facilitate such endeavors.

REFERENCES

1. Abrahamson, E., and Rosenkopf, L. (1993) Institutional and Competitive Bandwagons, in: *Academy of management review*, 487-517.

2. Aug 13 (2007) Los Angeles Airport Struggles With Delays, in: *The Wall Street Journal*, New York.

3. Bajwa, D.S., Rai, A., and Brennan, I. (1998) Key antecedents of executive information system success: a path analytic approach., *Decision Support Systems*, 22, 1, 31-43.

4. Brown, K.W., and Ryan, R.M. (2003) The Benefits of Being Present: Mindfulness and Its Role in Psychological Well-Being, *Journal of Personality and Social Psychology*, 84, 4, 822-848.

5. Butler, B.S., and Gray, P.H. (2006) RELIABILITY, MINDFULNESS, AND INFORMATION SYSTEMS, *MIS Quarterly*, 30, 2, 211-224.

6. Chang, J.C., and King, W.R. (2005) Measuring the Perfomance of Information Systems: A Functional Scorecard, *Journal of Management Information Systems*, 22, 1, 85-115.

7. DeShon, R.P., Kozlowski, S.W.J., Schmidt, A.M., Milner, K.R., and Wiechmann, D. (2004) A Multiple-Goal, Multilevel Model of Feedback Effects on the Regulation of Individual and Team Performance, *Journal of Applied Psychology*, 89, 6, 1035.

8. Doll, W.J. (1985) Avenues for Top Management Involvement in Successful MIS Development, *MIS Quarterly*, 9, 1, 17-35.

9. Fiol, C.M., and O'Connor, E.J. (2003) WAKING UP! MINDFULNESS IN THE FACE OF BANDWAGONS, *Academy of management review*, 28, 1, 54-70.

10. Guimaraes, T., and Igbaria, M. (1997) Client/server system success: exploring the human side, *Decision Sciences*, 28, 4, 851-876.

11. Hunter, R., Bace, J., and Caldwell, F. (2006) Childhood Ends: Liability and the IT Industry, *Gartner Research*, G00138877, pp. 1-35.

12. Lacity, M.C., and Hirschheim, R. (1993) The Information Systems Outsourcing Bandwagon, *Sloan Management Review*, 35, 1, 73.

13. Langer, E.J. (1989) Minding matters: The consequences of mindlessness-mindfulness, in: *Advances in experimental social psychology B2 - Advances in experimental social psychology,* L. Berkowitz (ed.), Academic Press, San Diego, 137-173.

14. Langer, E.J. (1992) Matters of mind: Mindfulness/mindlessness in perspective, *Consciousness and Cognition*, 1, 3, 289-305.

15. Langer, E.J. (1997) The power of mindful learning, Addison-Wesley, Reading, MA.

16. Langer, E.J. (2000) Mindful Learning, *Current Directions in Psychological Science*, 9, 6, 220-223.

17. Langer, E.J., Blank, A., and Chanowitz, B. (1978) The mindlessness of ostensibly thoughtful action: The role of "placebic" information in interpersonal interaction, *Journal of Personality and Social Psychology*, 36, 6, 635-642.

18. Levinthal, D.A., and March, J.G. (1993) The myopia of learning, in: *Strategic Management Journal*, 95-112.

19. Meindl, J.R., Stubbart, C., and Porac, J.F. (1994) Cognition Within and Between Organizations: Five Key Questions, *Organization Science*, 5, 3, 289-293.

20. Pinto, J.K., and Slevin, D.P. (1987) Critical factors in successful project implementation, *IEEE Transactions on Engineering Management*, EM - 34, 1, 22-27.

21. Ragu-Nathan, B.S., Apigian, C.H., Ragu-Nathan, T.S., and Tu, Q. (2004) A path analytic study of the effect of top management support for information systems performance, *Omega*, 32, 459-471.

22. Ragu-Nathan, B.S., and Ragu-Nathan, T.S. (1988) Impact of top management support on IS planning, *The Journal of Information Systems*, 2, 2, 15-23.

23. Roth, E.M. (1997) Analysis of decision making in nuclear power plant emergencies: An investigation of aided decision making., in: Naturalilstic decision making, C. Zsambok and G. Klein (eds.), Erlbaum, Mahwah, NJ, 175-182.

24. Sabherwal, R., Jeyaraj, A., and Chowa, C. (2006) Information System Success: Individual and Organizational Determinants, *Management Science*, 52, 12, 1849.

25. Sabherwal, R., and King, W.R. (1991) Towards a Theory of Strategic Use of Information Resources: An Inductive Approach, *Information & Management*, 20, 3, 191.

26. Sabherwal, R., and King, W.R. (1995) An empirical taxonomy of the decision-making processes concerning strategic applications of information systems, *Journal of Management Information Systems*, 11, 4, 177.

27. Sabherwal, R., Sein, M.K., and Marakas, G.M. (2003) Escalating commitment to information system projects: findings from two simulated experiments, *Information & Management*, 40, 8, 781-798.

28. Saunders, C.S., and Jones, J.W. (1992) Measuring performance of the information systems function, *Journal of Management Information Systems*, 8, 4, 125-154.

29. Schmidt, R., Lyytinen, K., Keil, M., and Cule, P. (2001) Identifying software project risks: An international Delphi study, *Journal of Management Information Systems* 17, 4, 5-36.

30. Seiling, J., and Hinrichs, G. (2005) MINDFULNESS AND CONSTRUCTIVE ACCOUNTABILITY AS CRITICAL ELEMENTS OF EFFECTIVE SENSEMAKING: A New Imperative for Leaders as Sensemanagers, *Organization Development Journal*, 23, 3, 82-88.

31. Sternberg, R.J. (2000) Images of mindfulness, *Journal of Social Issues*, 56, 1, 11-26.

32. Swanson, E.B., and Ramiller, N.C. (2004) INNOVATING MINDFULLY WITH INFORMATION TECHNOLOGY, *MIS Quarterly*, 28, 4, 553-583.

33. Weick, K.E., (1995) Sensemaking in Organizations Sage Publications, Thousand Oaks, CA.

34. Weick, K.E., and Roberts, K.H. (1993) Collective mind in organizations: Heedful interrelating on flight decks, *Administrative Science Quarterly*, 38, 357-381.

35. Weick, K.E., and Sutcliffe, K.M., (2001) Managing the Unexpected: Assuring High Performance in an Age of Complexity Jossey-bass, San Francisco.

36. Weick, K.E., Sutcliffe, K.M., and Obstfeld, D. (1999) ORGANIZING FOR HIGH RELIABILITY: PROCESSES OF COLLECTIVE MINDFULNESS, *Research in Organizational Behavior*, 21, 81.

37. Weill, P. (1992) The relationship between investment in information technology and firm performance: a study of the valve manufacturing sector, *Information Systems Research*, 3, 4, 307-333.

38. Wildavski, A., (1991) Searching for safety Transaction books., New Brunswick, NJ.

39. Yang, H.L. (1996) Key information management issues in Taiwan and US, *Information & Management*, 30, 251-267.