LEADERSHIP CLIMATE, ATTITUDES, AND

EVIDENCE-BASED MANAGEMENT BEHAVIOR

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Abstract: There is a huge gap between knowing and doing in organizations. Why do organizations find it so difficult to bridge the gap between practice and research? evidence-based management is an approach that tries to bridge this gap. To really grow and develop evidence-based management, we must better understand attitudes towards it and how the business context (inclusive of leaders, teams, etc.) encourages evidence-based practice. I introduce a theoretical framework that explains how social norms in an organization mediate between leadership climate and individual employees' intentions to implement evidence-based practice. The framework builds on the Theory of Planned Behavior, with elements from Self-Determination Theory and Sense-Making Theory. This study has resulted in novel, validated scales to measure the evidence-based management process, both on the individual and on the team level. While the study results did not fully support the multilevel, mediated model, they did add support to the individual-level model. Subgroup findings suggest that managers' behaviors are driven more by perceived requirements, while nonmanagers are more driven by their appeal to evidence-based practice.

Organizational interventions focusing on enhancing the leadership climate to foster evidence-based practice should aim for strengthening the perception that "evidence-based is the way we work in this organization" rather than focusing on individual employees' attitudes toward evidence-based practice. These interventions should be different for managers and nonmanagers.

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CHAPTER I

INTRODUCTION

Organizations display a huge gap between *knowing* and *doing* (Lamb, Greenlick, & McCarty 1998). Why do they find it so difficult to bridge the gap between *practice* and *research*, be it in healthcare or in management (Bensing 2000; Ferranti et al. 2010; Starkey & Madan 2001)? In healthcare, lives are at stake: Berwick (1991) made himself and the Institute for Healthcare Improvement world famous by creating an initiative that purportedly saved over 100,000 lives in 18 months by implementing *standard procedures that should already have been implemented in the first place* (Berwick et al. 2006; Wachter & Pronovost 2006). Rynes, Colbert, and Brown (2002) and Sanders, van Riemsdijk, and Groen (2008) showed a huge gap between what we *know* is effective in the field of human resources (HR) and what HR professionals *believe* to be effective.

Clearly over the last 50 years, especially in healthcare, a tremendous shift has taken place, integrating evidence in the decision-making process; but – as shown in the examples above – knowing and doing are not yet fully integrated. This is even more prevalent in the business world, where much of what is done is not based upon evidence but rather on gut reactions, experience, or some other nonscientific source (Pfeffer & Sutton 2006b; Sutton 2006).

Purpose of the Study

The purpose of this study is to explore how companies can make the switch from more experience-based to more evidence-based practices. This exploration is done through the

frameworks of three well-established theories: the theory of planned behavior, sense-making theory, and self-determination theory. The healthcare field serves as an example for this transition, as we can learn much from the experience-based to evidence-based paradigm shift that has taken place in medicine (Rosswurm & Larrabee 1999). The research in this study will augment the existing literature by providing a model that explains the mediating roles of social norm, attitudes, and perceived behavioral control between leadership climate and (intention to perform) actual evidence-based practice behavior in organizations. The model will extend the theory of planned behavior in a multilevel context, i.e., show the effect of team climate on individual behavior. Furthermore, an important purpose of the study is to test whether concepts and instruments from one domain (evidence-based medicine) can be "reused and recycled" in another domain (evidence-based management).

Theoretical Framework

The business world could stand to learn a great deal from the medical community in using evidence to make better decisions. In considering this broad question, several pieces of the research literature can be informative. One area upon which to build is the theory of planned behavior, which explains how attitudes, social norms, and perceived behavioral control lead to intentions; intentions are strong predictors of behavior (Ajzen 1991). However, before using Ajzen's theory, we need to establish that the premises of the theory of planned behavior actually work in evidence-based management (EBM) implementation (Michie et al. 2005). Equally important, we need to gain a deeper understanding of the impact that leadership can have on the adoption and use of EBM, and whether this effect is mediated by individual employees' attitudes, their social norms, and/or their perceived behavioral control. Self-determination theory explores how changes in intrinsic and extrinsic motivation lead to behavior modification (Deci et al. 1994). Gagné and Deci (2005) argue that autonomous motivation relates to effective job performance. Understanding the interplay between the cognitive "nuts and bolts" of behavior (theory of planned behavior) and the more

esoteric, deeper motivational and sense-making aspects (self-determination theory, sense-making theory) is relevant – one might argue even essential – to enable us to devise successful strategies to implement evidence-based practice in organizations. As it is, we do not know whether employees are more prone to behavioral changes with interventions modifying their attitudes, their perceived social norms, their motivations, or their interpretation of what is happening in the world around them (sense-making).

Research Questions

Considering the above, the rationale of this study is that the management field should learn from the transformation in medicine that took place during the last 50 years or so. The shift from experience-based medicine to evidence-based medicine was a slow, at some times tedious process. We can consider the introduction of evidence-based medicine as a paradigm shift, or merely one (arguably important) of several tools that help to answer the question "How should physicians practice medicine?" The healthcare management version of this question could be "How should healthcare dollars best be spent?" (Sehon & Stanley 2003). If we think evidence-based management is a valuable instrument (Chapter II will give arguments for this debate), then we will want to help business leaders (including healthcare management) to create an effective strategy to implement this practice in their organizations.

Therefore, several important questions are to be answered in this study. Some of the more important questions to be addressed are:

1. how/why does a leadership climate for evidence-based management come into existence?

2. how does a leader's team make sense of evidence-based management to become a behavior expectation/norm?

3. how does this social influence lead to higher engagement in evidence-based management practices?

Model Overview

    If we are interested in modifying the behavior of both managers and nonmanagers to implement evidence-based practice strategies in organizations, we can direct interventions to two levels (Figure 1). In both cases, the dependent variable is the same: actual evidence-based management behavior.

    The first level is the individual. The Theory of Planned Behavior gives us a strong theoretical framework to explore this level. The Evidence-Based Management Attitude Scale (which will be described in greater depth in Chapters II and III) has been used to show that antecedents to these attitudes are basically in the same four domains as in evidence-based medicine. While there is some evidence that a positive attitude relates to behavior in evidence-based medicine, this direct relation has not yet been established in management (Jette et al. 2003). Individuals may have the right attitude, but if they are perceived to be lacking in skills, ability, and/or opportunity (e.g., due to lack of time/access to research data), their perceived behavioral control will be low. It is likely that this will negatively influence their intention to engage in EBM. Conscientious employees generally will want to conform to what is expected from them and what is good for the organization. To do so, they look at people who are important to them: colleagues, managers, mentors, and opinion leaders. How their subjective norms of expected/good behavior interacts with their personal attitudes toward EBM behavior – and the amount of control they feel they have over this behavior – is an important part of the model's individual level.

    The second level is the team and/or the organization. Employees try to make sense of what happens around them. This sense-making influences their attitudes, norms ("none of my colleagues looks up research studies online, so I don't want to be considered the oddball"), and perceived behavioral control ("I know I should look this up, but I have a deadline to meet"). My model postulates that the leadership climate for EBM influences these factors. Theory supports this notion: the Theory of Planned Behavior's "Social Norm" antecedent can be considered the individual-level equivalent of climate. Self-Determination Theory explains how an extrinsic motivator can become part of one's own belief system.
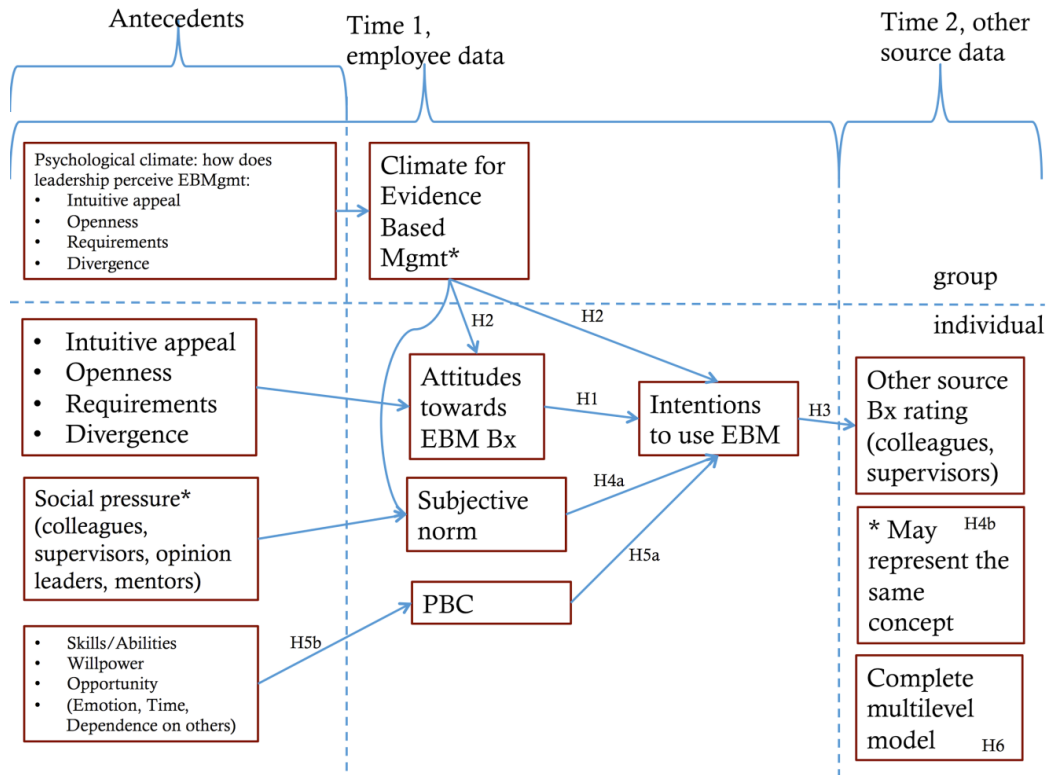
Figure 1. Multilevel Mediated Model
(EBM: Evidence-Based Management; PBC: Perceived Behavioral Control; BX: Behavior)

Summary

Building upon this brief introduction, the fundamental issue of this study is: attitudes toward evidence-based management may help develop the behavior required, but only within the right context. The context (climate) is influenced by persons (leadership) and organization (team/company level). To really grow and develop evidence-based management, we must better understand attitudes towards it and how the business context (inclusive of leaders, teams, etc.) encourages it.

CHAPTER II

REVIEW OF LITERATURE

The Evidence Behind Evidence-Based Management

A major imperative for the drive behind evidence-based management is the abundance of studies showing that many current management practices are either ineffective or downright damaging (Pfeffer & Sutton 2006b). Nutt (1999) estimates that about half of management decisions fail.

Before looking at the scientific attempts to quantify the value of EBM, it is important to realize that there are ethical and philosophical reasons to implement evidence-based practice. Managers have a fiduciary responsibility toward owners and, according to stakeholder theory, also to other stakeholders in the organization (Dodd 1932; Donaldson & Preston 1995; Joyner & Payne 2002). Managers therefore should try to maximize the benefit of their decisions, which precludes making decisions that they should or could have known to be ineffective or suboptimal. To know whether they fulfill their fiduciary responsibility by making effective decisions, managers therefore have to investigate the effect of those decisions (Drucker 1955, 1967). They can use the EBM framework to do so.

Evidence-based management is about making decisions through the conscientious, explicit, and judicious use of four sources of information: practitioner expertise and judgment, evidence from the local context, a critical evaluation of the best available

research evidence, and the perspectives of those people who might be affected by the decision

(Briner, Denyer, & Rousseau 2009, p. 19).

It is important, however, to realize that no definitive study quantifies the value of switching from management practice as usual to EBM. A 2009 systematic review found exactly zero research articles *directly* addressing the question of whether employing EBM improves organizational performance (Reay, Berta, & Kohn 2009). The lack of evidence for the EB methodology has lead to heated debates in the medical world as well. Criticism include the opinion that evidence-based medicine leads to "cookbook medicine," or that the focus on randomised clinical trials and meta-analyses has major constraints for "real" patients (who are almost by definition different from the "average" or standardized patients in clinical trials) (Feinstein & Horwitz 1997). Obtaining evidence from research studies may be complicated by statistical issues or, in Ioannidis words (2005, p. 696): "It can be proven that most claimed research findings are false." Some of the reasons for this are that in a scientific field, the chance that research findings are false is positively related to smaller studies, smaller effect sizes, larger numbers of (untested) relationships, more flexibility in statistical analyses, and larger financial interests and prejudices in the field. Gupta (2003) expands on this argument by noticing that evidence-based medicine, with its focus on research methodology, might conclude that an intervention is less effective than it actually is. An example might be the relative ease of researching antidepressant medication versus psychotherapy, which has resulted in an abundance of medication studies and a relative lack of psychotherapy effectiveness studies. This in turn may have led to overreliance on medication while psychotherapy may in fact have been more effective (Roest et al. 2015).

While the lack of research into the effect of evidence-based management on decision making is problematic, there are compelling reasons to expect that the switch to EBM is valuable for organizations. As Briner et al. (2009) explain, part of the critique on EBM may be due to a misunderstanding of what it is. EBM is *not* a rigid, single decision-making method, performed by management scholars, telling managers what to do and defining "best practices." EBM *is* a way of

thinking about making decisions consisting of a family of related decision-making procedures, performed by managers/ practitioners, intending to help both the process and outcome of practitioner decision making, and questioning ideas such as "best practices." EBM contains four elements: the process starts with an accurate problem statement by the manager. The second element is evaluating internal (organizational) data/evidence. The third element is evaluating external evidence, preferably through a systematic review. The fourth element is integrating stakeholder needs and ethical considerations. Then, the manager should make a decision incorporating all these elements (Briner et al. 2009). Breaking down EBM into these elements enables us to find evidence supporting those elements, which arguably is more straightforward than "showing that evidence-based management is effective." To find out the latter, preferably through a systematic review of a number of randomised controlled trials, may be too complex to be feasible.

One important finding in the research implementation literature is that there is an underutilization of the vast behavioral science evidence base relevant to effective organizational practice (Rousseau & McCarthy 2007). As a result, management consultants, business schools, and others may keep promoting outdated and/or dangerous theories and models (Ghoshal 2005; Sutton 2006). Interestingly, managers implementing popular, unproven management techniques did not perform better economically but were rated higher in management quality (Staw & Epstein 2000).

If managers search for evidence, do they change their practice? An important issue managers report is that the evidence they find is hard to operationalise for the problem at hand (Le May, Mulhall, & Alexander 1998). On the other hand, in a business simulation game, managers using decision support systems (DSS) made significantly more effective business decisions than their non-DSS counterparts (Sharda, Barr, & McDonnell 1988). This finding was later extended, as Devaraj and Kohli (2003, p. 285) found that "the greater the actual usage of (DSS) technology, the better the financial and quality performance" of the organizations involved. Using the technique of cumulative meta-analysis (adding new research results to the existing dataset whenever they became available),

Antman et al. (1992) found that regular review articles and expert opinions missed important new insights that were picked up in the meta-analyses.

In education, guided instruction has been found to be much more effective than "pure discovery learning" (i.e., learning by intuition) (Mayer 2004). Structured after-event reviews of both failures and successes (i.e., structured outcome evaluations) have been shown to improve future performance (Ellis & Davidi 2005).

Nutt (1999, p. 78) found that "managers often jump to conclusions and then try to implement the solution they reached. The bias for action causes them to limit their search, consider too few alternatives, and pay too little attention to people who are affected, not realizing that decisions fail for just these reasons." He found a correlation between the quality of the strategic decision-making process and the quality of the solutions found.

Studies looking at the implementation of proven, effective interventions in general found modest improvements in use of the intervention after the implementation. These studies took place in areas as wide apart as household energy conservation, promoting behavioral change among health professionals, and implementation of educational curriculum intervention research (Abrahamse et al. 2005; Bero et al. 1998; O'Donnell 2008). In general, some interventions were consistently effective. These include, for example, reminders, multifaceted interventions (a combination that includes two or more of the following: audit and feedback, reminders, local consensus processes, or marketing), and interactive educational meetings. Some interventions were consistently ineffective, including didactic materials and didactic educational meetings (lectures).

My conclusion then is that there are philosophical and ethical reasons to implement evidence-based practice considering the fiduciary responsibility of managers toward stakeholders of organizations. There is also research evidence showing the positive effects of implementing parts of the evidence-based management framework, including the implementation of proven interventions, effect of implementation of evidence-based guidelines, and adherence to a strategic decision-making process protocol. A major issue is the lack of research articles *directly* addressing the question of

whether employing EBM improves organizational performance. As both Cohen, Stavri, and Hersh (2004) and Haynes (2002) suggest, to better reflect its tenets, perhaps evidence-based practice should be renamed "methods of incorporating epidemiologic evidence into clinical practice," although they agree that the name change is unlikely to catch on because the term "evidence-based practice" sounds more catchy.

Attitudes Positively Relate to Intentions to Use Evidence-Based Management

As my model suggests, individual attitudes and contextual features for evidence-based management are two of the key drivers for intentions to use EBM practices. In a previous study, I defined four individual (antecedents to) EBM attitudes: *openness* to change and innovation, *appeal* of the innovative approach of EBM, likelihood of adoption of EBM practices given *requirements* by regulators and those higher in the hierarchy of the organization (e.g., to be transparent about the decision-making process), and perceived overlap (or *divergence*) between research-based and current practice (Bosman 2015). This study was based on Aarons' (2004) development of the Evidence-Based Practice Attitude Scale. Openness to change and innovation is an important factor in developing "learning organizations" (Anderson & West 1998). The persuasive power of the intuitive appeal of innovation has been the subject of much of Cialdini's research (Nolan et al. 2008). The likelihood of actually adopting evidence-based practice given requirements to do so (e.g., by management) differs from person to person (Garland, Kruse, & Aarons 2003). Finally, both in healthcare and in business, resistance may interfere with the introduction of new (evidence-based) methodologies that are perceived as different from current practices (Garland, Kruse, & Aarons 2003; Garvin 1993). Organizational and individual psychological theories (sense-making, self-determination theory) give theoretical understanding for the existence of the above-mentioned attitude factors (Deci et al. 1994; Weick, Sutcliffe, & Obstfeld 2005).

The adoption of evidence in the decision-making process is limited as managers may be unaware of relevant management evidence or may perceive evidence as a threat to their freedom to run their

organizations. Furthermore, adoption of EBM partly depends on managers' attitudes toward adoption of new management tools and approaches. As Ajzen (1991) shows in the Theory of Planned Behavior, intentions to perform behaviors can be predicted with high accuracy by attitudes toward the behavior, subjective norms, and perceived behavioral control. Therefore, reliable and valid measures of EBM are needed in order to advance the field and to determine how attitudes may or may not predict manager behavior.

   To the best of my knowledge, there are currently no reliable and validated measurement tools to assess manager's attitudes toward adoption of evidence-based management. To measure the attitudes of mental healthcare providers toward adoption of evidence-based practice, Aarons (2004) and Aarons et al. (2010) developed and validated the Evidence-Based Practice Attitude Sale (EBPAS). The EBPAS includes four dimensions of attitudes toward adoption of evidence-based practice: 1) appeal, 2) requirements, 3) openness, and 4) divergence. These four dimensions were adapted for management based on the following rationale.

Appeal

   The Appeal scale measures the extent to which a respondent would adopt an innovation if he/she found it intuitively appealing, if it "makes sense" to them, if colleagues are happy with it, and if they believe they would be able to successfully implement it (e.g., self-efficacy) (Aarons 2004; Stewart 2002; Walshe & Rundall 2001). According to Stewart (2002, p. 39) "Some managers believe that managing is mainly intuitive, whereas others think it is more of a science and that you must learn the tools of management." Current management reports "show signs of moving in a direction of 'intuitive' decision making among managers" (Rousseau & McCarthy 2007, p. 93). Aarum-Andersen (2000) report that the majority of managers believe that decisions based on intuition are effective. Other studies show that managers are more interested in information derived from other managers than in information derived from research articles (Brown & Duguid 2002; Wenger, MacDermott, & Snyder 2002). Moreover, it appears that the roles of social networks, opinion leaders, and the

organizational context have a greater influence than the evidence itself (Davies & Nutley 2001; Nutley, Smith, & Davies 2000). Rousseau and McCarthy (2007) explain this by the fact that managers are often unacquainted with the related evidence. Finally, Walshe and Rundall (2001) note that the management culture may limit the intuitive appeal of managers to consider evidence-based management.

Requirements

Compliance with requirements illustrates how managers may respond to organizational rules and regulations. Walshe and Rundall (2001, p. 445) argue that "managerial decisions are often constrained by wider system requirements such as resource availability, pressures in the healthcare marketplace, organizational policies and procedures, and stakeholders' views and interests. These factors may influence the decision-making process or even conflict with research findings." These factors can also include organizational requirements that may mandate, support, or complicate the use of evidence in the decision-making process. According to Rousseau and McCarthy (2007), evidence-based management requires the manager to have the capacity to search for and evaluate evidence in the decision-making process. However, organizational requirements to use EBM may belie the complexity of the task. Aarons and colleagues (2007) found that although some healthcare practitioners may be more or less compliant with required changes, individual and organizational variability is associated with attitudes.

Openness

Individual openness to change is an important component of the workplace climate that can impact innovation (Aarons 2004). Openness to new management styles such as evidence-based management can be seen as the willingness to try or do new things. Pfeffer and Sutton (2006a) argue that EBM requires that managers have a willingness to change. Stewart (2002) concludes that managers' personal beliefs about how to manage influences whether they will accept the need for (or even the possibility of) EBM. Understanding and questioning beliefs about managing is one aspect of

determining managers' attitudes toward EBM. Rousseau (2006) notes that EBM requires the openness, capacity, and willingness to appropriately use resources and time, and organizational characteristics are associated with individual openness to change (Aarons 2004).

Divergence

Divergence measures the perceived discrepancy between research-based/academically developed interventions and current practices (Aarons 2004). For example, an individual may consider that his/her own experiences and knowledge provide greater guidance into management techniques and strategies as compared to evidence-based management that may be based on general principles derived from research rather than an embedded knowledge and deep understanding of managing in a particular context and for a particular goal or goals. Thus, the Divergence subscale measures the extent to which a manager perceives EBM and decision making as not useful and less important than practical experience. Resistance toward the adoption of EBM may lie in the hands of managers, who must embrace the concept to make it work. Rousseau and McCarthy (2007) find that practicing EBM can create accountability. That is, when norms in managerial tasks are based on validated principles, managers are accountable for intuitive decisions (Rousseau 2006). Developing EBM as a standard could require managers to justify their actions based on evidence-based research. This, and the fact that managers may find it difficult to evaluate whether the use of evidence in their decision-making processes lead to a better outcome, may lead to resistance to the implementation of EBM (Walshe & Rundall 2001).

Hypothesis 1: *EBM attitudes positively relate to intentions to use EBM practices.*

Climate for Evidence-Based Management and Intentions to Use It

What is the role of leadership in developing a climate supportive of evidence-based management? To answer this question, we have to divide the process into two parts. The first question is that of what organizational/leadership climate leads an organization to consider implementing evidence-based practice. The second question is, once this choice has been made, what climate should the

organization strive for to result in successful implementation of evidence-based practice. An intervention using the Full Range Leadership Model (Aarons et al. 2015) facilitated the development of general leadership and strategic leadership to support evidence-based practice implementation. The intervention measured "full range leadership," defined as a combination of transformational and transactional leadership styles. The transformative leadership style has been shown to be related to enhancing innovation in organizations (Avolio, Bass, & Jung 1999).

While the Full Range Leadership study shows an effective intervention to train first-level leaders to implement evidence-based practice, it is important to realize that this intervention took place in organizations that were already committed to it. In other words, it does not explain which characteristics in these organizations caused them to acquire their evidence-based practice climate in the first place.

Because of a well-documented self-selection process, organizations with a certain climate tend to attract people fitting into that particular climate (Morgan 2006; Pondy & Mitroff 1979; Smircich 1983). Thus, I hypothesize that an important antecedent to implementation of evidence-based management is that an organization has the right organizational attitudes toward EBM in place. Leadership climate is the "organizational attitude" equivalent of individual attitudes (Hicks-Clarke & Iles 2000). I suggest that this climate – in a process parallel to evidence-based management individual attittudes – consists of several factors, including openness to change and innovation, appeal of the innovative approach of evidence-based practice, willingness to implement the practice given requirements by regulators and those higher in the hierarchy of the organization to do so (e.g., to be transparant about the decision-making process), and perceived overlap (or divergence) between research-based and current practice.

Self-determination theory says individuals (including both managers, their leaders, and their employees) can either *introject* or *integrate* the regulation of uninteresting though important activities (Deci et al. 1994). The differentiating factor between introjection (taking in a value but not accepting it as one's own) and integration (taking in a regulation within one's core sense of self) is whether

one's social context supports self-determination. This is exactly what we have seen in the introduction

of evidence-based medicine in the past 50 years or so. Healthcare providers did introject the premises

of evidence-based medicine, i.e., paid lip service to the fact that their practices should be based on

scientific evidence, but the full self-regulation of their practices lagged. Berwick's (1991) 100,000

lives campaign became a success by pushing healthcare providers to evaluate whether their current

practices fully adhered to their belief systems (as defined in the Hippocrate Oath and, if it did not,

whether they found the consequences acceptable. (They did not: hence their change in practice, which

made the 100,000 lives campaign a success.) I hypothesize that leadership makes the difference

between introjection and integration of evidence-based management through a direct, positive effect

on attitudes and intentions to use EBM.

Hypothesis 2: *Leadership climate for Evidence-Based Management has a direct, positive*

effect on attitudes and intentions to show evidence-based management behavior.

Intentions and Actual Evidence-Based Management Behavior

Many studies have shown a strong correlation between intention and behavior. This correlation

was about .47 in a meta-analysis of 185 studies (Armitage & Conner 2001). To test causality in the

interaction between intention and behavior, Webb and Sheeran (2006) performed a meta-analysis on

studies that manipulated intention to measure its effect on behavior. According to their meta-analysis,

a medium to large change in intention led on average to a small to medium effect in behavior. Some

caveats mentioned by Webb and Sheeran (2006) are the difference between behavioral intention

("The next time you have to make a decision, do you intend to search the literature?) versus

behavioral expectation ("How likely is it, the next time you have to make a decision, you will search

the literature?"), and the effect of repeated practice on behavior (where a practice repeated regularly

is a stronger predictor of future behavior than intention).

Hypothesis 3: *Intention to use evidence-based management is positively related to evidence-*

based management behaviors.

Subjective Norm Positively Relates to Intentions to Use Evidence-Based Management

Subjective norm (an individual's perception of a certain behavior) is influenced by the individual's perception of the judgment of significant others (normative beliefs – in my model, social pressure by colleagues and superiors). Management attitude (i.e., leadership climate) directly influences these normative beliefs (Fogarty & Shaw 2010). An educational intervention influencing normative beliefs about Jewish-Muslim relations reduced by a factor of 16.57 Pakistani students' intentions to join a Muslim youth force, which was described as "defending Muslim identity and honor, by opposing and fighting enemies of Islam such as Jews." While the study did not include a formal climate measure, this should be considered a very substantial effect on anti-Jewish climate. As such, it shows the overlap between (antecedents to) normative beliefs and climate (Amjad & Wood 2009). Bandura (1995) describes the tight interrelation between collective efficacy and self-efficacy. A school's sense of collective efficacy at the beginning of the academic year predicts student results by the end of the year, even when controlling for confounders like socio-economic status of the students (Bandura 1995). Several other studies have established the effect of climate on subjective norm, further adding to the evidence that there is a significant overlap between normative beliefs and (psychological) climate, and these may in fact represent the same concept (Bock et al. 2005; Fischer et al. 2009; Fogarty & Shaw 2010).

Hypothesis 4a: *Subjective norm positively relates to intentions to use evidence-based management practices.*

Hypothesis 4b : *There is a strong correlation between social pressure (which is an antecedent to subjective norm), and leadership climate.*

Perceived Behavioral Control Positively Relates to Intentions to Use Evidence-Based Management

Ajzen's (1991) Theory of Planned Behavior explains the mediating effect of intentions between attitudes, perceived behavioral control, and actual behavior. Perceived behavioral control serves as a

proxy of actual behavioral control. Actual behavioral control refers to the skills, resources, and other prerequisites needed to perform a given behavior. As Sparks, Guthrie, and Shepherd (1997) show, there are issues in conceptualizing and operationalizing perceived behavioral control. Chan and Fishbein (1993) show that female college students may perceive to have the skill to ask their partners to use a condom, but find it embarrassing to ask. Sparks et al. (1997) explain this by claiming that perceived behavioral control consists of two independent components: while a behavior may be under perceived *control* (e.g., college students having the skill to use a condom), the subjects may not behave accordingly because of perceived *difficulty* (asking their partners to cooperate).

Skills in our context can be defined as the ability to perform the tasks associated with evidence-based management. In healthcare, a significant relationship has been established between evidence-based practice by nurses and their skills using and interpreting relevant literature (Gerrish & Clayton 2004; Melnyk et al. 2004).

To be able to measure skills sets among physicians, Ramos, Schafer, and Tracz (2003) developed the Fresno test, which is a test of knowledge and skills in evidence-based medicine. It has been shown to be able to differentiate between experts and novices in evidence-based medicine. The Fresno test begins with the presentation of two scenarios that suggest clinical uncertainty. Short-answer questions about the clinical scenarios require the candidate to formulate a focused question, identify the most appropriate research design for answering the question, show knowledge of electronic database searching, identify issues important for determining the relevance and validity of a given research article, and discuss the magnitude and importance of research findings. These questions are scored by using a standardized grading system. A series of calculations and fill-in-the-blank questions follow.

Guyatt et al. (2000, p. 954) warn against this highly specific definition of evidence-based medicine skills: "Not all clinicians need to appraise evidence from scratch, but all need some skills." The inherent problem with the Fresno approach, especially in the field of management, is that it is very hard to define a knowledge and skills set that covers everything a manager has to be able to do and know to be an evidence-based professional. A more generic approach is to address these skills

and behaviors in a number of facets relevant to evidence-based practice: critical thinking; defining the decision process; running experiments/observations in the local context; gathering/evaluating research evidence; evaluating stakeholder needs and ethical considerations (Briner et al. 2009).

Hypothesis 5a: *Perceived behavioral control positively relates to intentions to use and actual behavior of EBM practices*

Hypothesis 5b: *Critical thinking, defining the decision process, running experiments/ observations in the local context, gathering/evaluating research evidence; evaluating stakeholder needs and ethical considerations are antecedents to perceived behavioral control.*

Complete Multilevel Moderated-Mediated Model

Hypothesis 6: *I expect to find support for the hypothesized model such that intentions mediate the effects of evidence-based management climate, evidence-based management attitudes, subjective norm and perceived behavioral control on evidence-based management behavior.*

Summary

Managers have a fiduciary responsibility to maximize the benefit of their decisions. One of the instruments in their toolboxes is evidence-based management.

Evidence-based management is about making decisions through the conscientious, explicit, and judicious use of four sources of information: practitioner expertise and judgment, evidence from the local context, a critical evaluation of the best available research evidence, and the perspectives of those people who might be affected by the decision (Briner et al. 2009, p. 19).

While there is a lack of research into the effect of evidence-based management on organizational performance, the effectiveness of the individual components of the methodology has been well established.

What will persuade managers and nonmanagers to use more of their evidence-based toolboxes? My framework suggests that this can be explained by a combination three theories: Sense-making Theory, Self-Determination Theory, and Theory of Planned Behavior. Once attitudes, norms, climate, and/or actual behavior start changing, individuals sense these changes and incorporate them in their own belief systems, which enhances the resilience of the behavioral change.

CHAPTER III

METHODOLOGY

Model Constructs

My model (Figure 1) proposes four individual level, mediating dimensions (attitude, subjective norm, perceived behavioral control, and intention). The dependent variable is the individual-level dimension of actual behavior. The individual-level dimensions mediate between the dependent variable and the team-level leadership climate dimension. The proposition is that the stronger the evidence-based management leadership climate and its antecedents, the more likely both managers and nonmanagers are to perform behavior in line with evidence-based management practice. Thus, the model proposes that an individual's behavior is influenced both by individual-level and group-level dimensions. An alternative hypothesis (H4b in Figure 1) is that climate is actually an integral part of the Theory of Planned Behavior through its social norm construct (which is itself an antecedent to subjective norm). The theoretical implication of this is that the Theory of Planned Behavior is actually a multilevel, rather than an individual-level, model.

Dimension Constructs

Evidence-Based Management Scale of Attitudes

To be able to further study attitudes of managers toward the adoption of evidence-based management, it is important to have a validated measurement tool to quantify their (antecedents

to) attitudes toward EBM. Therefore, I developed the Evidence-Based Management Scale of Attitudes (EBMAS Attitudes, or EBMAS-A), a questionnaire that measures attitudes toward adoption of EBM. The final version of the EBMAS-A is composed of 15 items with standardized response options (Appendix C). The items are organized into four subscales as described above: Appeal, Requirements, Openness, and Divergence. The EBMAS-A has been validated for content validity, internal consistency, and construct validity among over 500 professionals in the U.S. with management experience. This measurement has already been developed and will be submitted for publication soon (Bosman 2015).

To measure perceived benefits of practicing EBM (i.e, actual attitudes measure), a three-item scale was used. This scale defines what EBM is ("Evidence-Based Management is the conscientious use of the best available evidence from scientific research and from your own organization's data in making decisions."), and then asks for responses to the following three statements: 1) evidence-based management can make me make better decisions, 2) evidence-based management can make me more effective in my work, 3) evidence-based management is not relevant/useful/does not help (reverse formulated item). Items were scored on a five-point Likert scale from "Strongly Agree" to "Strongly Disagree." Development of this scale took place during a session with the Content Validity Expert. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) should confirm the validity of the items. Convergent validity was assessed by comparing the results with the above mentioned EBMAS-A. Divergent validity was to be assessed by comparing the results with the IPIP Happiness (Managerial Potential) scale, as it is unlikely that managerial happiness is a predictor of the conscientious use of the best available evidence (although there is some evidence that happiness predicts career success) (Boehm & Lyubomirsky 2008; Gough 1975.).

Climate For Evidence-Based Management

The shift from experience-based to evidence-based practice is a true paradigm shift. Melnyk et al. (2004) found that in healthcare systems, this shift required interventions that not only increase nurses'

evidence-based practice knowledge and skills, but also strengthen their beliefs about the benefit of evidence-based care. This shift thus likely requires several facets of climate, including climate for quality and climate for innovation.

To measure the climate for evidence-based management this study was used to develop a new EBMAS version, EBMAS-Climate (or EBMAS-C) based on the EBMAS-A. EBMAS-A uses a four-factor structure measuring requirements, appeal, openness, divergence. EBMAS-C consists of two measures. One measures how managers experience these on the team level (psychological climate/ cognitive schema approach). The other measures how their subordinates experience their managers' leadership roles in these four factors. To "transpose" the EBMAS-A to a measurement of climate, a modified version of the guidelines for translation of instruments of the World Health Organization (2013) were used. For an example of such a transposition, see Table 1. The versions of the two EBMAS-Climate scales are composed of 15 items with standardized Likert-type response options ranging from 0 = not at all, 1= to a slight extent, 2 = to a moderate extent, 3 = to a great extent, and 4 = to a very great extent. For convergent validity, the Team Climate Inventory was used, as this is the "gold standard" in work-group innovation measures (Anderson & West 1998). For divergent validity, the IPIP Self-Sufficiency scale was used, which contains items such as "I act without consulting others; I do things my own way; I let myself be directed by others (reverse scored) (6FPQ Preliminary Scales,, Goldberg et al., 2005.).

Table 1. Example of Translation of Questionnaire to New Domains

Questionnaire	Question
Evidence Based Practice Attitude Scale	I like to use new types of therapy/interventions to help my clients
Evidence Based Management Scale – Attitude	I like to use new types of management tools/ approaches for my organization
Evidence Based Management Scale –Climate (Leader's Experience)	My team likes to use new types of management tools/approaches for our organization
Evidence Based Management Scale – Climate (Team Experience)	My manager stimulates me to use new types of management tools/approaches for our organization

Subjective Norm Scale (Including Normative Beliefs)

I have postulated that subjective norm consists of the following four factors.

1. Local norms: what is acceptable in my norm group (colleagues, supervisors, opinion leaders, mentors)

2) Symbolic support (we say we practice evidence-based practice but we do not)

3) Instrumental/actual practice support

4) Social pressure (colleagues, supervisors, opinion leaders, mentors).

I developed a scale to measure these factors according to the routine described above. For convergent validity, I used the EBMAS-Climate mentioned above. For divergent validity, I used the previously mentioned IPIP Self-Sufficiency scale.

Perceived Behavioral Control/Self-Efficacy Scale

I developed a scale measuring the two factors of perceived behavioral control (perceived control, perceived difficulty to practice EBM) and their antecedents. I developed a separate scale for skills/behavior (see next paragraph). Antecedents to *control* are:

1) do I have the skills to practice EBM?

2) am I willing to practice EBM?

Antecedents to *difficulty* are:

1) do I receive encouragement to practice EBM from leadership (e.g., board support), colleagues, supervisors, opinion leaders, mentors?

2) does my environment enable me to practice EBM: time, resources, access to advice/databases?

The first step was item generation. I completed this stepr with help from the Content Validity Expert. Steps 2, 3, and 4 were performed as described above.

Evidence-Based Management Scale of Skills/Behavior

As described above, a generic approach to measuring EBM-related skills is to address skills – and behavior – in a number of facets relevant to evidence-based practice. In a discussion with the Content Validity Expert, I defined the following five facets for both the skills and the behavior domain: critical thinking, defining the decision process, running experiments/observations in the local context, gathering/evaluating research evidence, evaluating stakeholder needs and ethical considerations, willingness to follow guidelines. In a new measurement, I addressed these five factors using slightly different wording to differentiate between skills and behavior.

1) Behavior (a. self behavior rating: "In your day to day work, how often do you …," b. other behavior rating: "in his/her day to day work, how often does your colleague/employee …").

2) Skills: "How confident are you in your ability to …".

Items were generated with help from the Content Validity Expert. I performed other steps as described above. For these measures, the gold standard for construct validity would be observation of actual behavior, which unfortunately is not feasible in this study.

Methodology

Sample and Data Collection Procedures

Phase I consisted of the creation and validation of the surveys needed for the next phases of this study. This phase was conducted online, using Amazon Mechanical Turk. The advantages of using MTurk workers in the behavioral sciences have been reported (Buhrmester, Kwang, & Gosling 2011; Mason & Suri 2012). Participants were be 18 years or older managers in the United States. They

received a small fee to fill out the survey (\$ 1.00). To prevent "participation spamming," no mention was made of our preference for managers, and nonmanager respondents weren filtered out before processing the data. As my previous MTurk research has shown, this further prevents social desirability bias – which has been shown to be lower in online surveys than in face-to-face surveys in the first place (Kreuter, Presser, & Tourangeau 2008). Participants followed a link on MTurk to the survey on Qualtrics.com. There they were able to view and download an Information Participation Sheet (Appendix A). Acceptance of the sheet was necessary to fill out the surveys.

Phase II used the scales validated in Phase I to measure the individual-level model in an online sample of healthcare executives. This phase took place as an individual online survey. Participants were members of one of the U.S. healthcare executives associations. The survey was sent to 5,000 healthcare executives. One of the questions in this survey was whether the participant's organization would be willing to participate in a multilevel study.

Phase III consisted of measuring the multilevel model. Those respondents in Phase II that volunteered for the team-based survey received information about the Phase III study. Unfortunately, while some interest was expressed, none of the physician leader organizations decided to participate in the multilevel study. Therefore, organizations were recruited via word of mouth (LinkedIn, my personal email address book, alumni of a university offering the Masters in Medical Management). Forty organizations accepted participation in the multilevel study. They were asked to supply names and email addresses of team members (one manager and at least four employees per team). A participant information sheet and a link to the online surveys were then sent to these healthcare managers and their employees. In our multilevel design, the number of groups is more relevant than the number of participants per group. A rule of thumb suggests 20-50 groups should suffice (de Leeuw & Meijer 2008). Out of the 40 teams that volunteered, 24 teams participated with one team leader and at least one team member.

Survey Development

Since there were no pre-existing scales for most of the items in the multilevel model, they had to be developed. Several authors describe standardized procedures to develop and validate surveys (Hinkin 1998; Terwee 2007). Ajzen (1991) and Bandura (2006) published guides to develop the Theory of Planned Behavior self-efficacy questionnaires. I will first describe the procedures used to develop the scales needed for this study, and then I will describe the actual scales.

Survey Development Procedures

The development of validated surveys consists of six steps (Hinkin 1998). I used the first five steps. Step 6 can be assessed in a follow-up study, which is beyond the scope of this dissertation.

Step 1: Item Generation. An inductive approach was used for the development of items in the surveys. Ideally, each factor should consist of three to five items. Item development and content validity assessment followed the Hinkin (1998) and other guidelines (Edwards 1983; Schriesheim et al. 1993; Warwick & Lininger 1975). One of my dissertation committee members acted as Content Validity Expert to help with item generation for the surveys.

Step 2: Questionnaire Administration. The new surveys were administered via Amazon Mechanical Turk, along with previous, established surveys (the so-called nomological network). Although there is no hard rule reflecting the number of participants, numbers of 200-300 are considered adequate (Guadagnoli & Velicer 1988). Luckily, using a crowd-sourcing approach on Amazon, the amount of potential survey takers is virtually unlimited.

Step 3: Initial Item Reduction. This step uses EFA and Internal Consistency Assessment. The rule of thumb for EFA is a factor loading of at least .40 and/or at least twice as strong on the appropriate factor as on another factor. The rule of thumb for percentage variance explained is .60 or higher and a coefficient alpha minimum of .70.

Step 4: CFA. This procedure is used to assess the quality of the model (χ^2, degrees of freedom, goodness of fit indices, item t-values, modification indices).

Step 5: Convergent/Discriminant Validity. This consists of comparison of the measure with other established measures that on theoretical grounds should or should not correlate to the new measure.

Step 6: Replication. This step can be assessed in a follow-up study, which is beyond the scope of this dissertation.

Model Analysis Methodology

All data analysis took place in R (Version 3.2.2) using the RStudio interface (Version 0.99.486)[1] (R Core Team 2015; RStudio Team 2015). I performed a CFA on all measures. This replicated the findings from the survey development phase. The following hypotheses were tested using a correlation matrix and/or path analysis: Hypotheses 1, 3, 4A, 4B, 5A. For Hypothesis 5B, a simultaneous regression analysis was performed.

The validity of the multilevel model was tested using the Bliese (2013) multilevel package for R. In case of a positive outcome, further multilevel analysis would have taken place using the Hayes (2012) PROCESS macro. This macro was used for mediation analysis. Based on the Bliese (2013) multilevel aggregation indices results, Ihad to revert to the individual-level model. Thus, for Hypothesis 6, a series of path analyses was performed using R's lavaan package (Rosseel 2012).

Summary

This study explores a multilevel mediating model, measuring the effect of leadership climate on evidence-based management intentions and behavior in teams. All (team and individual) constructs were developed *de novo*, based on established theoretical frameworks. Exploratory and confirmatory factor analysis were used for the survey development. For the multilevel analyses I planned to use the Hayes PROCESS macro. The individual-level model was tested using path analysis.

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[1] The most recent versions of these packages were used with R: lavaan, psych, coefficientalpha, data.table, multilevel, semPlot.

CHAPTER IV

FINDINGS

This study attempted to answer the following questions: 1) how/why does a leadership climate for evidence-based management come into existence? 2) how does a leader's team make sense of EBM to become a behavior expectation/norm? 3) how does this social influence lead to higher engagement in EBM practices?

To answer these broad questions, a multilevel, mediated model was proposed, and surveys were developed to validate the model. Eight hypotheses were proposed, and their findings will be reported in this chapter. In the next chapter, an attempt will be made to use the findings of this study to answer the three questions above.

Full survey development is described in Appendix C. Survey development led to the surveys described in the appendix, which were used in hypothesis testing.

Hypothesis Analysis and Findings

The first step in the analysis will be to establish whether climate can be aggregated. If that is the case, we can then test the group-level effect of leadership climate on the individual-level dependent variable EBM behavior. If the multilevel model is not significant, I will have to limit my analysis to the individual level.

A rule of thumb for aggregation indices suggests the following values: $r_{wg} > .7$; ICC(1) significant; ICC(2) > .7 (Castro 2002). Using the Bliese (2013) bootstrapping approach, R suggests that the 95% confidence interval for a significant r_{wg} is 0.98 (i.e., my r_{wg} should be above

0.98 to be considered significant). My r_{wg} is 0.77 – which is not significant. Bliese prefers the r_{wg} (lindell) as the regular r_{wg} has a tendency to be too high. I therefore also calculated the r_{wg} (lindell) value, which was lower than the regular r_{wg} (as expected). Since the multilevel aggregation indices are not significant, I will have to defer to an individual-level model to test Hypotheses 2 and 6.

Table 2. Aggregation Indices

r_{wg}	r_{wg} (lindell)	ICC(1)	ICC(2)
0.7676	0.5737	0.02800551	0.07956027

Hypothesis 1.

Evidence-based management attitudes positively relate to intentions to use EBM practices. The path model regressions clearly show there is no significant relationship between attitudes and intentions (Table 12). The large, negative, but nonsignificant effect in the manager group likely is a spurious phenomenon due to the small sample size.

The correlation matrix does show a significant correlation between EBM attitudes (total score) and intentions in the full sample. In the nonmanager subgroup, this correlation was significant as well, but not in the manager subgroup.

Table 3. Hypothesis 1 (Attitude Four Subfactors and Total Score vs. Intention)

	Requirements	Appeal	Openness	Divergence	Attitude (Total)
Intention (Mgr)	0.25	0.18	0.43[*]	0.27	0.40
Intention (NonMgr)	0.09	0.15	0.31[**]	0.09	0.23[*]
Intention (All)	0.09	0,16	0.36[***]	0.07	0.24[*]

$*p < 0.05$; $**p < 0.01$; $***p < 0.005$

Hypothesis 2

Leadership climate for EBM has a direct, positive effect on attitudes and intentions to show EBM behavior. The path model regression estimates (Table 4) show a significant relationship between leadership climate and attitude in all three groups. The relationship between climate and intention is not statistically significant.

Table 4. Path Model Regression Estimates (Nonstandardized) (Hypothesis 2)

	All	Managers	Nonmanagers
Climate → Attitude	0.106^*	0.154^*	0.103^*
Climate → Intention	0.007	0.147	0.000

*$p < 0.05$; **$p < 0.01$; ***$p < 0.005$

Hypothesis 3

Intention to use EBM is positively related to EBM behaviors. Assessment of Hypothesis 3 can be done in two ways. The path model regressions (Table 12) show a significant relationship between intention and actual behavior in all three groups. To assess whether specific behaviors correlate with intention, I will have to look at the correlation matrix between these variables. The correlation is significant in the nonmanagers subgroup between intention and research/organizational behavior, but not in the manager subgroup.

Table 5. Hypothesis 3 (Correlation Matrix)

	Research Behavior	Organizational Behavior
Intention (All)	0.37^{***}	0.33^{***}
Intention (Managers)	0.31	0.28
Intention (Nonmanagers)	0.41^{***}	0.31^{**}

*$p < 0.05$; **$p < 0.01$; ***$p < 0.005$

Hypothesis 4a

Subjective norm positively relates to intentions to use EBM practices. The path model shows significant relations between subjective norm and intentions in the full group and in the nonmanager subgroup. Results from the bivariate correlation matrix between subjective norm and intentions can be found in Table 6.

Table 6. Hypothesis 4a (Correlation Matrix)

	Subjective Norm
Intention (All)	0.50^{***}
Intention (Managers)	0.59^{**}
Intention (Nonmanagers)	0.47^{***}

*$p < 0.05$; **$p < 0.01$; ***$p < 0.005$

Hypothesis 4b

There is a strong correlation between social pressure (which is an antecedent to subjective norm) and leadership climate. As my path analysis is based on the bivariate correlation matrix, the correlation matrix is where I have to look for correlations between the observable variables. The correlation matrix shows there is a strong correlation (> .50) between social pressure and leadership climate for managers. There is a significant (but not strong) correlation for nonmanagers. Interestingly, managers seem to be more likely to relate social pressure to requirements, whereas nonmanagers associate social pressure with appeal. This might be due to different levels of self-determination.

Table 7. Hypothesis 4b (Leadership Climate vs. Social Pressure)

	Requirements	Appeal	Openness	Divergence	Total Score
Social Pressure (Managers)	0.52^{**}	0.29	0.34	0.35	0.60^{**}
Social Pressure (Nonmanagers)	0.14	0.25^{*}	0.23	0.06	0.24^{*}

$*p < 0.05; **p < 0.01; ***p < 0.005$

Hypothesis 5a

Perceived behavioral control positively relates to intentions to use and actual behavior of EBM practices. According to the path model regressions, there is a positive relationship between perceived behavioral control on the one hand, and intentions and behavior on the other. This is true in the full group and in both subgroups. The bivariate correlation index shows that in the nonmanager subgroup this is significant only for the relationship between perceived behavioral control and intention.

Table 8. Hypothesis 5a (Perceived Behavioral Control)

	Research Behavior	Organizational Behavior	Actual Behavior	Intention
PBC (All)	0.25^{*}	0.28^{**}	0.27^{**}	0.34^{***}
PBC (Managers)	0.50^{*}	0.50^{*}	0.46^{*}	0.42^{*}
PBC (Nonmanagers)	0.13	0.17	0.18	0.28^{*}

$*p < 0.05; **p < 0.01; ***p < 0.005$

Hypothesis 5b

Critical thinking, defining the decision process, running experiments/observations in the local context, gathering/evaluating research evidence, evaluating stakeholder needs, and ethical considerations are antecedents to perceived behavioral control. Using simultaneous regression, only evaluating stakeholder needs was found to be a significant antecedent to perceived behavioral control.

Table 9. Hypothesis 5b

	Estimate	*p*-value
Running experiments/observations in the local context	-0.046905	0.3793
Defining the decision process	-0.003138	0.9537
Gathering research evidence	0.047845	0.4215
Evaluating research evidence	0.042640	0.4574
Critical thinking	0.090894	0.0946.
Evaluating stakeholder needs	0.116059	0.0275[*]

*p < 0.05; **p < 0.01; ***p < 0.005

Hypothesis 6

i expect to find support for the hypothesized model such that intentions mediate the effects of evidence-based management climate, evidence-based management attitudes, subjective norm and perceived behavioral control on evidence-based management behavior. I used a technique called mediation analysis to establish *how* an independent variable (in our case leadership climate) influences an outcome variable (in our case evidence-based management behavior) (Baron & Kenny 1986). Mediation analysis shows whether the independent variable influences the dependent variable directly, or whether there is support for the hypothesis that one or more intermediate variables (mediators) are involved. My model contains a series of mediators (Figure 2): Attitude, Subjective Norm, Perceived Behavioral Control, and Intention. The PROCESS macro was used to calculate serial mediation statistics (Hayes 2012). This method showed that the direct effect of leadership climate on evidence-based management behavior was not significant. Significance was found using a

bootstrapping approach for an indirect effect, indicating that indeed intentions mediate the effects of

its antecedents on behavior (Table 10).
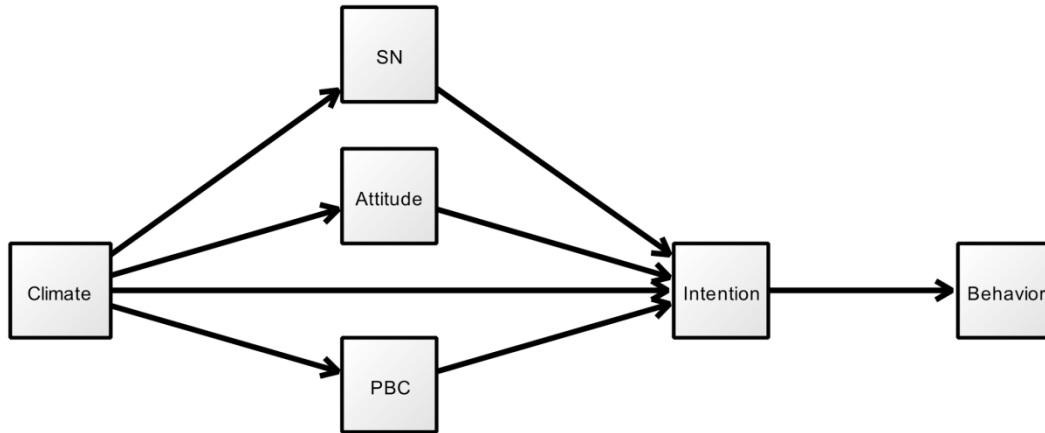
Figure 2. Individual-Level Path Model
(SN: Subjective Norm; Attitude: Behavioral Value; PBC: Perceived Behavioral Control)

Table 10. Direct and Indirect Effects of Climate on Behavior

	Effect	SE	LLCI	ULCI	*p*
Direct Effect of Climate on Behavior	-0.0606021736	0.0424237815	-0.1446848674	0.0234805202	0.1560086112
Total Indirect Effects of Climate on Behavior	0.093603920	0.0322192910	0.0302212729	0.1584917305	*

LLCI: lower level confidence interval. ULCI: Upper level confidence interval.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.005$

To further test support for the hypothesized model, I used the lavaan package to run path model

statistics (Rosseel 2012). The path model shows significance for the nonmanager subgroup but not for

the manager subgroup. The full group is not significant either. The rules of thumb for significance

were: $\chi^2 > 0$; Root Mean Square Error of Approximation (RMSEA) < .08; RMSEA 90% confidence

interval lower bound < .05; Comparative Fit Index (CFI) > .9; Tucker-Lewis Index (TLI) > .9;

Standardized Root Mean Square Residual (SRMR) <.1.)
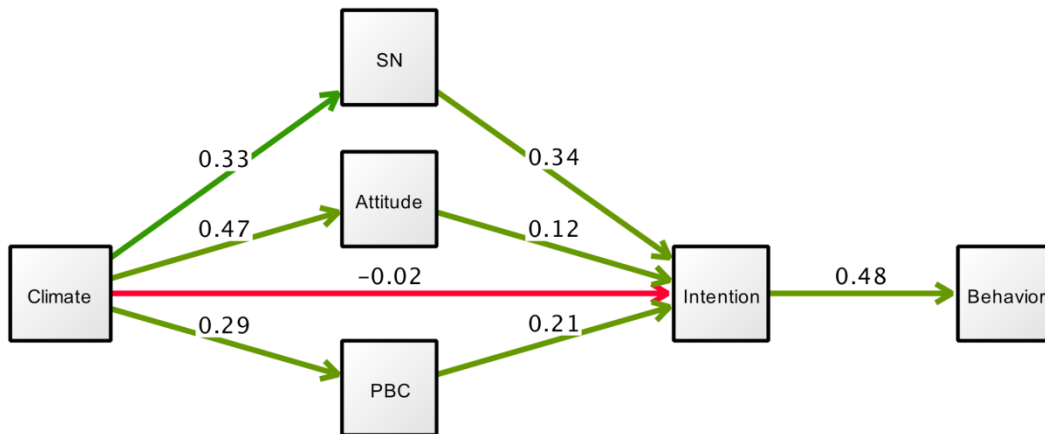
F**igure 3. Path Model with Standardized Estimates (All)**
(SN: Subjective Norm; Attitude: Behavioral Value; PBC: Perceived Behavioral Control)
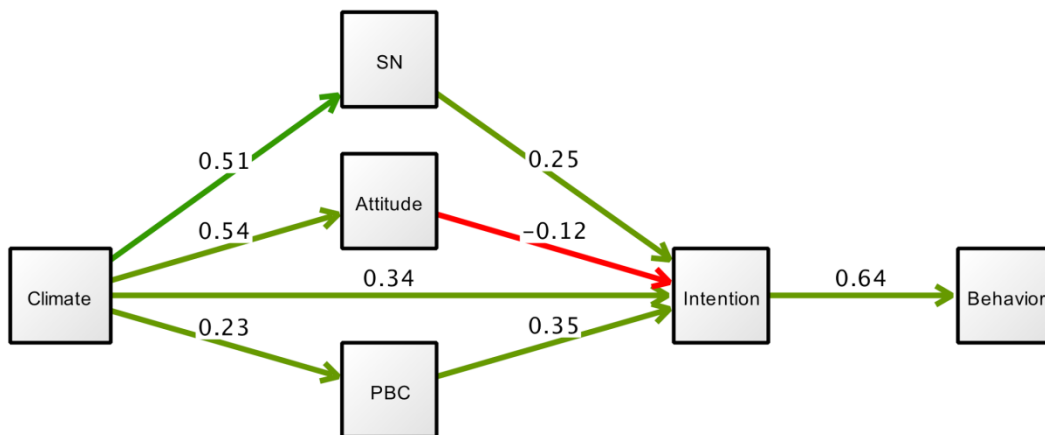
Figure 4. Path Model with Standardized Estimates (Managers)
(SN: Subjective Norm; Attitude: Behavioral Value; PBC: Perceived Behavioral Control)
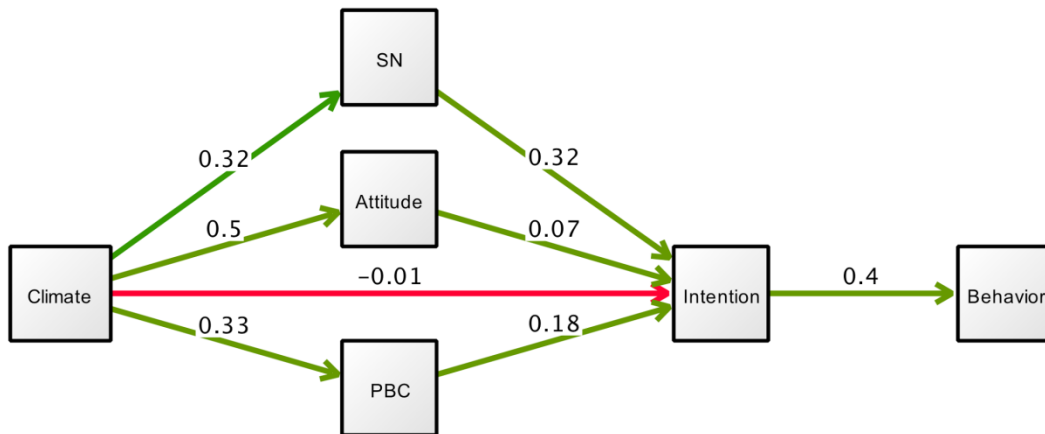
Figure 5. Path Model with Standardized Estimates (Nonmanagers)
(SN: Subjective Norm; Attitude: Behavioral Value; PBC: Perceived Behavioral Control)

Table 11. Individual-Level Path Model

	χ^2	DF	CFI	TLI	RMSEA	90% CI	SRMR
All (N = 115)	33.059	7	0.803	0.578	0.180	0.121 – 0.133	0.104
Managers (N = 26)	30.842	7	0.622	0.191	0.362	0.237 – 0.497	0.162
Nonmanagers (N = 72)	13.199	7	0.918	0.825	0.100	0 – 0.182	0.076

Table 12. Individual-Level Path Model Regressions (Actual Estimates).

Regressions	All		Manager		Nonmanager	
	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
Behavior (Total Score) – Intention	0.648	0.000[*]	0.804	0.000[*]	0.560	0.000[*]
Intention – Subjective Norm	0.330	0.000[*]	0.335	0.163	0.528	0.002[*]
Intention – Behavioral Value (Attitude)	0.177	0.197	-0.185	0.511	0.102	0.530
Intention – PBC	0.414	0.014[*]	0.595	0.027[*]	0.368	0.076.
PBC – Leadership Climate	0.048	0.001[*]	0.058	0.234	0.049	0.001[*]
Behavioral Value (Attitude) – Leadership Climate	0.106	0.000[*]	0.154	0.001[*]	0.103	0.00[*]
Intention – Leadership Climate	0.007	0.839	0.147	0.102	-0.003	0.940
Subjective Norm – Leadership Climate	0.067	0.000[*]	0.165	0.002[*]	0.050	0.006[*]

*$p < 0.05$; **$p < 0.01$; ***$p < 0.005$

Table 13. Individual-Level Path Model R^2

	All	Managers	Nonmanagers
Behavioral Value (Attitude)	0.223	0.290	0.253
Social Norm	0.107	0.263	0.079
PBC	0.082	0.052	0.111
Intention	0.202	0.397	0.159
Behavior (Total Score)	0.230	0.415	0.161

Summary

In Phase I, eight novel surveys were developed, measuring climate, attitudes, social norm, perceived behavioral control, intention, and actual behavior related to evidence-based management practice. These surveys were developed and validated via Amazon Mechanical Turk. In Phase II, these surveys were used to measure evidence-based management attitudes among physician leaders (data not reported). In Phase III, a multilevel, mediated model was tested among teams in organizations. Each team consisted of one manager and one or more employees. Since the aggregation indices did not support the multilevel model, further analyses were done on the individual

level. Possibly due to group size, only the nonmanager subgroup path model was significant. It showed that intention mediates between evidence-based management behavior and social norm. The indirect effect of climate on behavior was less clear.

CHAPTER V

DISCUSSION

Measuring Evidence-Based Management Practice

This study has resulted in novel, validated scales to measure the evidence-based management process. The scales included the "classical" components of the Theory of Planned Behavior (attitudes, subjective norm, perceived behavioral control, intention, behavior) plus leader and employee climate measures. The content of these scales was based on theory and expert opinion. The attitude and climate scales were "translated" from scales developed for evidence-based medicine. Validation took place through a statistical process including exploratory and confirmatory factor analyses and discriminant and convergent validity testing where applicable.

Overall, this process shows that it is possible and feasible to reuse scales from one domain in another domain. This technique adds greatly to the efficiency of the research process. "Recycling" or "transposing" scales is a form of replication – and replication is arguably one of the more important but undervalued components of evidence-based practice. As reported before, the focus on novelty in the social sciences publication cycle may lead to positive publication bias and acceptance of research findings as true when in reality they do not represent a factual model of reality (Tsang & Kwan 1999; Agrillo & Miletto Petrazzini 2012; Ioannidis 2005).

Hypothesis Testing

Multilevel Model

Aim of this dissertation research was to study the multilevel hypothesis in a large enough number of teams, preferably in a relatively homogeneous group of healthcare organizations. A large healthcare executives organization offered its support in reaching out to its membership to participate in the study; 340 members of this organization participated in an individual level study. However, only a small number of these volunteered for the team-based multilevel study. To supplement these, I executed a wider form of convenience sampling. My own professional network (phone, email, executive graduate school alumni, LinkedIn contacts) was invited to participate in the study. In total, 40 teams volunteered, of which 26 teams participated in time with one team leader and one or more employees. Most of these firms were healthcare, university, or information technology related. The sample was very diverse, with organizations based in the U.S., Canada, and Western Europe. As shown by the aggregation indices, the multilevel model did not reach significance. It is likely that a combination of factors contributed to this, including the limited sample size and the nonhomogenous background of the organizations (several different industries, cultural differences). A number of healthcare organizations showed interest in participating in a follow-up study after this dissertation to measure the evidence-based climate in multiple teams in their organizations. This would enable me to measure differences within companies to see whether an intervention can be devised that changes social norm, attitudes, intentions, and/or behavior.

Individual-Level Model

The theory of planned behavior is one of the two main theoretical models behind the individual-level hypotheses. This theory postulates that the intention to show certain behavior mediates between actual behavior and attitudes, subjective norm, and perceived behavioral control. In addition, Self-Determination Theory was introduced. This theory tries to explain how people are motivated both by external factors and internal factors and how these factors interplay. Evidence-based practice is

arguably not the most *sexy* behavior. It requires a person who is ready to make a spot decision to step back, take a broader view, search for and evaluate evidence, research its applicability in the current situation, modify the findings to fit the current situation, and – after execution – evaluate the outcomes. One can easily imagine how much more fun it is to just follow one's hunch (intuitive decision making). Self-determination theory explains that incorporating the evidence-based approach into one's work flow can go through two routes: autonomous motivation and controlled motivation (Gagné & Deci 2005). As the evidence-based approach is not intrinsically motivating for most people (being inherently more tedious than intuitive decision making), the level of external motivation will define where people are on the sliding scale between controlled and autonomous motivation.

In this study, I clearly see this in the individual-level model. While individual attitudes toward evidence-based management are strongly related to the evidence-based climate in the organization (.47 in the path analysis; correlations of $> .5$ on the Behavioral Value measure; $> .7$ on the EBMAS Attitude Total measure), the actual intention to work in an evidence-based way has a (significant but) extremely small (and therefore practically irrelevant) correlation to perceived behavioral control and attitudes. Therefore, I can conclude that attitudes do not mediate the effect between evidence-based climate and behavior. On the other hand, intention is significantly related to subjective norm. In other words, a decision maker's attitudes do not predict behavior, but their assessment of what their significant others consider important *does* predict behavior (e.g., what would my colleagues do in this situation, what does my boss want me to do). In a broader perspective, while this study has not looked at (Big Five) personality traits, this fits in with the widely reported finding that conscientiousness is an important predictor of job performance (Dudley et al. 2006). Basically, people want to do good, do what they think others consider good behavior, even (or maybe especially) for behavior that is not inherently motivational in nature.

Does this mean we should not focus on individuals' attitudes or skills if we want to modify their behavior? This is an intriguing question that this study cannot answer directly. My hypothesis is that the answer is not so clear cut. A follow-up study with a control group could establish whether an

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intervention aimed at boosting evidence-based management attitudes would, as a side effect, modify the perceptions of study participants of the social norms in their organizations ("apparently this is the behavior we expect from each other in this firm"). This, my study predicts, would in turn enhance the individual intention to perform such behavior.

Overall Research Questions

In the introduction, three important questions were asked: 1) how/why does a leadership climate for evidence-based management come into existence? 2) How does a leader's team make sense of evidence-based management to become a behavior expectation/norm? and 3) how does this social influence lead to higher engagement in evidence-based management practices?

Sense-Making Theory helps answer these questions by giving a framework to interpret the research findings of this study (Weick et al. 2005). Sense-making occurs as a retrospective process of pattern recognition. As Weick et al. (p. 411) describe, "sense-making does not begin *de novo*, but like all organizing, occurs amidst a stream of potential antecedents and consequences." Given their tendency to adapt their behavior to the social norm as they experience it (as evidenced by the individual model in this study), once employees perceive the seed of evidence-based management is pruning, the leadership climate may come into existence. The leadership climate was operationalized in this study as containing openness to change and innovation, appeal of the innovative approach of evidence-based management, likelihood of adoption of EBM practices given requirements to do so (i.e., transparency about the decision-making process), and perceived overlap (or divergence) between research-based and current practice.

As the results of Hypothesis 4b show, in the manager subgroup a strong (0.52) and significant correlation exists between experienced social norm and likelihood of adoption of EBM practices given requirements to do so. In the nonmanager group, however, the correlation between social norm and requirements is not significant. In the latter group, there is a significant correlation (0.25) between social norm and appeal of the innovative approach of EBM. In other words, managers may

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feel others around them will expect them to use evidence-based practice if there are outside forces requiring them to do so (externally controlled motivation), while nonmanagers may use their intrinsic motivation to color their experience of the social norm (i.e., their interpretation of what the outside world expects from them). To cite Weick et al. (2005, p. 415): "Sense-making is not about truth and getting it right. Instead, it is about continued redrafting of an emerging story so that it becomes more comprehensive, incorporates more of the observed data, and is more resilient in the face of criticism."

From Experience-Based to Evidence-Based Medicine

As described in the introduction, the shift from experience-based to evidence-based practice is a true paradigm shift. It may be useful to look at factors influencing that paradigm shift in healthcare to have a better understanding of how the paradigm shift may occur in the management field. Melnyk et al. (2004) found that once nurses believed in the importance of evidence-based practice, they were more motivated to acquire knowledge about the subject. Another important finding was that knowledge and beliefs about evidence-based practice are related to the extent that nurses engage in it, which has important implications for future intervention trials to accelerate evidence-based care (Melnyk et al. 2004). McAlister et al. (2001) found the same among physicians: while physicians were enthusiastic about the advantages of evidence-based practice, barriers to use were limited knowledge and skills about the basic concepts. However, physicians showed great interest in learning more.

This fits in well with the findings of my study and the postulated framework of sense-making and self-determination theories. The healthcare community is a much more homogenous community than the business world, with mostly (post-)academically educated workers and opinion leaders. This community has always focused on research and innovation, so the ideas of an evidence-based climate have come to fruition decades earlier than in general business. When the ideas were firmly implanted, more and more healthcare workers started adopting the premises of evidence-based practice, some mostly because they felt the requirement to do so (external motivation), some mostly because the

concepts appealed to them (internal motivation). Many experienced a combination of both (the concepts appealed to them, they were asked to acquire the skills to practice evidence-based medicine, or sought training themselves). At some point, the social norm as experienced by the practitioners was so strong it became a paradigm shift. At that point, the attitude of the individual practitioner became less relevant as not adhering to evidence-based practice meant one would choose social isolation.

Making Sense of Evidence-Based Management as a Norm

Many feel they are suffering from information overload rather than from too little data to support decision-making processes in their organizations (Edmunds & Morris 2000). In 1997, Mutch (1997) came up with the concept of information literacy as a strategy to deal with information overload. If we apply the sense-making perspective to this 1997 article (using "a retrospective process of pattern recognition" (Weick et al. 2005), this was an early form of evidence-based practice in the management field. Mutch and many others in the workplace tried to deal with information overload through ad-hoc, structured processes. Interestingly, Rutkowski et al. (2013) report that overload can be created when individuals are asked to respond to requests to use too many new technologies. We should definitely be careful not to create this type of overload when implementing evidence-based practice! Some found these processes appealing and/or were open to change and became early adopters. Others were motivated more by requirements or external pressure. This is how a social norm formed. We should recall that a social norm does not *exist* per se. A social norm is the interpretation of a collection of persons (in this case in the workplace) about how significant others (managers, colleagues, family, etc.) would behave in such a situation and how these significant others would want this individual to behave. It is likely that the emergence of evidence-based practice as a social norm will take longer in the business universe than in the much less heterogeneous world of graduate degree-holding healthcare professionals.

Toward Higher Engagement in Evidence-Based Management Practice

There is a significant correlation between openness to change/innovation (one of the four attitude subscales) and self-reported evidence-based management skills. This suggests that participants in our study who were interested in the concepts of evidence-based management were looking toward acquiring the evidence-based skill set as well. However, from the study results it is clear that not attitude but social norm is the driving factor between leadership climate and evidence-based management behavior. This is not the first time that no clear correlation was found between attitudes and intention to perform a certain behavior. As early as in 1988, Beatty and Kahle found that – contrary to the expectations set out by Ajzen's Theory of Reasoned Action (the immediate predecessor to the Theory of Planned Behavior) – subjective norm and intention (but not attitude) influenced soft drink consuming behavior in a marketing study. The answer to higher engagement therefore lies in shaping a leadership climate so that both managers and nonmanagers will experience that their peers (managers, employees) expect them to use the evidence-based approach.

CHAPTER VI

CONCLUSION

Summary of Findings

Based on surveys developed to measure attitudes to evidence-based *medicine*, a series of

surveys was developed to measure climate, attitude, subjective norm, perceived behavioral

control, and intention to perform evidence-based *management* behavior. In my sample of teams

consisting of managers and nonmanagers, *subjective norm* was the mediator between leadership

climate and intention to perform evidence-based management behavior. Overall *attitude* toward

evidence-based management behavior had no effect on intention. In the manager subgroup,

requirements to perform evidence-based practice predicted evidence-management behavior,

whereas in the nonmanager subgroup the *appeal* of evidence-based practice predicted this

behavior. *Social norm* and *leadership climate* correlated, suggesting that they may be equivalents.

Theoretical Implications

In my overall sample, evidence-based management attitude was not related to intention. An

explanation may lie in the strong effect of subjective norm. Evidence-based management

behavior requires a certain investment in the short term (formulate question, search and evaluate

evidence; i.e., time and effort) with an uncertain benefit in the future (better decision, better

outcome for the organization or stakeholders). According to self-determination theory, it is likely

that there is more extrinsic than intrinsic motivation to perform this behavior (potentially tedious,

time consuming). Extrinsic motivation can become autonomous, i.e., experienced as being

part of one's self. I postulate that evidence-based management behavior (and more generally, any behavior with delayed rewards, e.g. smoking cessation) depends more on one's experience of social norms/social pressure than on one's attitudes (Chassin, Presson, & Sherman 1984).

Implications of Understanding

This study has attempted to answer three questions. First, how/why does a leadership climate for evidence-based management come into existence? Second, how does a leader's team make sense of evidence-based management to become a behavior expectation/norm?

The answer to these questions lies in self-determination and sense-making theories. Once employees perceive that the practice of evidence-based management is valued by their peers and managers, the leadership climate may come into existence. In sense-making terms, retrospectively a person senses that a social norm has come into existence that values evidence-based management behaviors. In self-determination terms, the person incorporates the value that evidence-based management behavior is good. This can happen either through external motivation (responding to requirements, in our study the significant factor for managers) or internal motivation (the behavior is appealing, in our study the significant factor for nonmanagers).

This brings us to the third question: how does this lead to higher engagement in evidence-based management practices? The answer to higher engagement lies in shaping a leadership climate so that both managers and nonmanagers will experience their peers (managers, employees, and possibly other significant others such as family members) expectation that they will use the evidence-based approach.

Implications for Researchers

The instruments developed in this study enable researchers to further the collective knowledge about successful strategies toward the implementation of evidence-based management. The multilevel layer added to the Theory of Planned Behavior extends its applicability and opens new research options to better understand the influence of teams and organizations on individual's behavior.

Limitations of the Study and Suggestions for Future Research

This study's sample consisted of just 24 teams. It could not find support for the full multilevel model. Therefore, a replication in a larger sample is warranted. To limit the effect of cultural differences, the replication should take place within one industry (e.g., healthcare) and within one country.

As the current study suffers from common method bias, an attempt should be made to replicate the study using other than self-reported behavior ratings (Podsakoff et al. 2003). A future study should test whether it is possible to measure differences between groups within organizations. One or more intervention studies should focus on measuring which interventions influence social norms so that (intention to perform) evidence-based management behavior is enhanced. A larger replication of the current study should attempt to retest the multilevel hypothesis.

REFERENCES

Aarons, G.A. 2004. "Mental Health Provider Attitudes Toward Adoption of Evidence-Based Practice: The Evidence-Based Practice Attitude Scale (EBPAS)." *Mental Health Services Research* 6 (2): 61–74.

Aarons, G.A., M.G. Ehrhart, L.R. Farahnak, and M.S. Hurlburt. 2015. "Leadership and Organizational Change for Implementation (LOCI): A Randomized Mixed Method Pilot Study of a Leadership and Organization Development Intervention for Evidence-Based Practice Implementation." *Implementation Science: IS* 10 (1). doi:10.1186/s13012-014-0192-y

Aarons, G.A., C. Glisson, K. Hoagwood, K. Kelleher, J. Landsverk, G. Cafri, and Research Network on Youth Mental Health. 2010. "Psychometric Properties and U.S. National Norms of the Evidence-Based Practice Attitude Scale (EBPAS)." *Psychological Assessment* 22 (2): 356–65.

Aarons, G.A., E.J. McDonald, A.K. Sheehan, and C.M. Walrath-Greene. 2007. "Confirmatory Factor Analysis of the Evidence-Based Practice Attitude Scale (EBPAS) in a Geographically Diverse Sample of Community Mental Health Providers." *Administration and Policy in Mental Health and Mental Health Services Research* 34 (5): 465–69.

Aarum Andersen, J. 2000. "Intuition in Managers: Are Intuitive Managers More Effective?" *Journal of Managerial Psychology* 15 (1): 46–63.

Abrahamse, W., L. Steg, C. Vlek, and T. Rothengatter. 2005. "A Review of Intervention Studies Aimed at Household Energy Conservation." *Journal of Environmental Psychology* 25 (3): 273–91.

Agrillo, C., and M.E. Miletto Petrazzini. 2012. "The Importance of Replication in Comparative Psychology: The Lesson of Elephant Quantity Judgments." *Frontiers in Psychology* 3 (June): 181.

Ajzen, I. 1991. "The Theory of Planned Behavior." *Organizational Behavior and Human Decision Processes* 50 (2): 179–211.

Amjad, N., and A.M. Wood. 2009. "Identifying and Changing the Normative Beliefs about Aggression Which Lead Young Muslim Adults to Join Extremist Anti-Semitic Groups in Pakistan." *Aggressive Behavior* 35 (6): 514–19.

Anderson, N.R., and M.A. West. 1998. "Measuring Climate for Work Group Innovation: Development and Validation of the Team Climate Inventory." *Journal of Organizational Behavior* 19 (3): 235–58.

Antman, E.M., J. Lau, B. Kupelnick, F. Mosteller, and T.C. Chalmers. 1992. "A Comparison of Results of Meta-Analyses of Randomized Control Trials and Recommendations of Clinical Experts: Treatments for Myocardial Infarction." *JAMA: The Journal of the American Medical Association* 268 (2): 240–48.

Armitage, C.J., and M. Conner. 2001. "Efficacy of the Theory of Planned Behaviour: A Meta-Analytic Review." *British Journal of Social Psychology* 40 (4): 471–99.

Avolio, B.J., B.M. Bass, and D.I. Jung. 1999. "Re-Examining the Components of Transformational and Transactional Leadership Using the Multifactor Leadership." *Journal of Occupational and Organizational Psychology* 72 (4): 441–62.

Bandura, A.. 1995. *Self-Efficacy in Changing Societies*. New York: Cambridge University Press.

———. 2006. "Guide for Constructing Self-Efficacy Scales." *Self-Efficacy Beliefs of Adolescents* 5 (307-337). .http://books.google.com/books?hl=nl&lr=&id=Cj97DKKRE7AC&oi=fnd&pg= PA307&dq=bandura+self-efficacy&ots=cGZWw-pJt6&sig=HGs2IFNaOD7JKXx-19xxZSN1bk.

Baron, R.M., and D.A. Kenny. 1986. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations." *Journal of Personality and Social Psychology* 51 (6): 1173–82.

Beatty, S.E., and L.R. Kahle. 1988. "Alternative Hierarchies of the Attitude-Behavior Relationship: The Impact of Brand Commitment and Habit." *Journal of the Academy of Marketing Science* 16 (2). Springer-Verlag: 1–10.

Bensing, J. 2000. "Bridging the Gap.: The Separate Worlds of Evidence-Based Medicine and Patient-Centered Medicine." *Patient Education and Counseling* 39 (1): 17–25.

Bero, L.A., R. Grilli, J.M. Grimshaw, E. Harvey, A.D. Oxman, and M.A. Thomson. 1998. "Closing the Gap between Research and Practice: An Overview of Systematic Reviews of Interventions to Promote the Implementation of Research Findings." *BMJ : British Medical Journal* 317 (7156): 465–68.

Berwick, D.M. 1991. "Controlling Variation in Health Care: A Consultation from Walter Shewhart." *Medical Care* 29 (12): 1212–25.

Berwick, D.M., D.R. Calkins, C. McCannon, and A.D. Hackbarth. 2006. "The 100,000 Lives Campaign: Setting a Goal and a Deadline for Improving Health Care Quality." *JAMA: The Journal of the American Medical Association* 295 (3): 324–27.

Bliese, P. 2013. *Multilevel Modeling in R (2.5)*.

Bock, G.W., R.W. Zmud, Y.G. Kim, and J.N. Lee. 2005. "Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate." *The Mississippi Quarterly*, 87–111.

Boehm, J.K., and S. Lyubomirsky. 2008. "Does Happiness Promote Career Success?" *Journal of Career Assessment* 16 (1): 101–16.

Bosman, M.. 2015. "Managers' Attitudes Toward Adoption of Evidence-Based Management: The Evidence-Based Management Attitude Scale (EBMAs): An International Comparison of the Influence of Culturally Influenced Values and Sentiments and Big Five Personality Factors on Evidence-Based Management Attitudes," October. http://papers.ssrn.com/sol3/papers.cfm? abstract_id=2676262.

Briner, R.B., D. Denyer, and D.M. Rousseau. 2009. "Evidence-Based Management: Concept Cleanup Time?" *The Academy of Management Perspectives* 23 (4): 19–32.

Brown, J.S., and P. Duguid. 2002. *The Social Life of Information*. Cambridge MA: Harvard Business Press.

Buhrmester, M., T. Kwang, and S.D. Gosling. 2011. "Amazon's Mechanical Turk A New Source of Inexpensive, Yet High-Quality, Data?" *Perspectives on Psychological Science: A Journal of the Association for Psychological Science* 6 (1): 3–5.

Castro, S.L. 2002. "Data Analytic Methods for the Analysis of Multilevel Questions A Comparison of Intraclass Correlation Coefficients, Rwg(, Hierarchical Linear Modeling, within- and between-Analysis, and Random Group Resampling." *The Leadership Quarterly* 13: 69–93.

Chan, D. K-S, and M. Fishbein. 1993. "Determinants of College Women's Intentions to Tell Their Partners to Use Condoms." *Journal of Applied Social Psychology* 23 (18): 1455–70.

Chassin, L., C.C. Presson, and S.J. Sherman. 1984. "Cognitive and Social Influence Factors in Adolescent Smoking Cessation." *Addictive Behaviors* 9 (4): 383–90.

Cohen, A.M., P. Z. Stavri, and W.R. Hersh. 2004. "A Categorization and Analysis of the Criticisms of Evidence-Based Medicine." *International Journal of Medical Informatics* 73 (1): 35–43.

Davies, H.T.O., and S.M. Nutley. 2001. *Evidence-Based Policy and Practice: Moving from Rhetoric to Reality*.

Deci, E.L., H. Eghrari, B.C. Patrick, and D.R. Leone. 1994. "Facilitating Internalization: The Self-Determination Theory Perspective." *Journal of Personality* 62 (1): 119–42.

de Leeuw, J., and E. Meijer. 2008. *Handbook of Multilevel Analysis*. New York: Springer.

Devaraj, S., and R. Kohli. 2003. "Performance Impacts of Information Technology: Is Actual Usage the Missing Link?" *Management Science* 49 (3): 273–89.

Dodd, E.M. 1932. "For Whom Are Corporate Managers Trustees?" *Harvard Law Review*, 1145–63.

Donaldson, T. and L.E. Preston. 1995. "The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications." *Academy of Management Review. Academy of Management* 20 (1): 65–91.

Drucker, P.F. 1955. "'Management Science' and the Manager." *Management Science* 1 (2): 115–26.

———. 1967. "The Effective Decision." *Harvard Business Review*, February 1.

Dudley, N.M., K.A. Orvis, J.E. Lebiecki, and J.M. Cortina. 2006. "A Meta-Analytic Investigation of Conscientiousness in the Prediction of Job Performance: Examining the Intercorrelations and the Incremental Validity of Narrow Traits." *The Journal of Applied Psychology* 91 (1): 40–57.

Edmunds, A., and A. Morris. 2000. "The Problem of Information Overload in Business Organisations: A Review of the Literature." *International Journal of Information Management* 20 (1): 17–28.

Edwards, A.L. 1983. *Techniques of Attitude Scale Construction*. New York: Ardent Media.

Ellis, S, and I Davidi. 2005. "After-Event Reviews: Drawing Lessons from Successful and Failed Experience." *The Journal of Applied Psychology* 90 (5): 857.

Feinstein, A.R., and R.I. Horwitz. 1997. "Problems in the 'Evidence' of 'Evidence-Based Medicine.'" *The American Journal of Medicine* 103 (6): 529–35.

Ferranti, J.M., M.K. Langman, D. Tanaka, J. McCall, and A. Ahmad. 2010. "Bridging the Gap: Leveraging Business Intelligence Tools in Support of Patient Safety and Financial Effectiveness." *Journal of the American Medical Informatics Association: JAMIA* 17 (2): 136–43.

Fischer, Ronald, Maria Cristina Ferreira, Eveline Assmar, Paul Redford, Charles Harb, Sharon Glazer, Bor-Shiuan Cheng, et al. 2009. "Individualism-Collectivism as Descriptive Norms

Development of a Subjective Norm Approach to Culture Measurement." *Journal of Cross-Cultural Psychology* 40 (2): 187–213.

Fogarty, G.J., and A. Shaw. 2010. "Safety Climate and the Theory of Planned Behavior: Towards the Prediction of Unsafe Behavior." *Accident; Analysis and Prevention* 42 (5): 1455–59.

Gagné, M., and E.L. Deci. 2005. "Self-Determination Theory and Work Motivation." *Journal of Organizational Behavior* 26 (4): 331–62.

Garland, A.F., M. Kruse, and G.A. Aarons. 2003. "Clinicians and Outcome Measurement: What's the Use?" *The Journal of Behavioral Health Services & Research* 30 (4): 393–405.

Garvin, D.A. 1993. "Building a Learning Organization." *Harvard Business Review* 71 (4): 78–91.

Gerrish, K., and J. Clayton. 2004. "Promoting Evidence-Based Practice: An Organizational Approach." *Journal of Nursing Management* 12 (2): 114–23.

Ghoshal, S. 2005. "Bad Management Theories Are Destroying Good Management Practices." *Academy of Management Learning & Education* 4 (1): 75–91.

Goldberg, L.R., J.S. Johnson, H.W. Eber, R. Hogan, Michael C. Ashton, C.R. Cloninger, and H.G. Gough. 2005. "The International Personality Item Pool and the Future of Public-Domain Personality Measures." Presidential Symposium, Sixth Annual Meeting of the Association for Research in Personality.

Gough, H.C. 1975. *Manual for the California Psychological Inventory*. Palo Alto CA: Consulting Psychologist Press.

Guadagnoli, E., and W.F. Velicer. 1988. "Relation to Sample Size to the Stability of Component Patterns." *Psychological Bulletin* 103 (2): 265.

Gupta, M. 2003. "A Critical Appraisal of Evidence-Based Medicine: Some Ethical Considerations." *Journal of Evaluation in Clinical Practice* 9 (2): 111–21.

Guyatt, G.H., M.O. Meade, R.Z. Jaeschke, D.J. Cook, and R.B. Haynes. 2000. "Practitioners of Evidence Based Care : Not All Clinicians Need to Appraise Evidence from Scratch but All Need Some Skills." *BMJ : British Medical Journal* 320 (7240): 954.

Hayes, A.F. 2012. "PROCESS: A Versatile Computational Tool for Observed Variable Mediation, Moderation, and Conditional Process Modeling." *Manuscript Submitted for Publication*. http://www.personal.psu.edu/jxb14/M554/articles/process2012.pdf.

Haynes, R.B.. 2002. "What Kind of Evidence Is It That Evidence-Based Medicine Advocates Want Health Care Providers and Consumers to Pay Attention To?" *BMC Health Services Research* 2 (1): 3.

Hicks-Clarke, D., and P. Iles. 2000. "Climate for Diversity and Its Effects on Career and Organisational Attitudes and Perceptions." *Personnel Review* 29 (3): 324–45.

Hinkin, T.R. 1998. "A Brief Tutorial on the Development of Measures for Use in Survey Questionnaires." *Organizational Research Methods* 1 (1): 104–21.

Ioannidis, J.P.A. 2005. "Why Most Published Research Findings Are False." *PLoS Medicine* 2 (8): e124.

Jette, D.U., K. Bacon, C. Batty, M. Carlson, A. Ferland, R.D. Hemingway, J.C. Hill, L. Ogilvie, and D. Volk. 2003. "Evidence-Based Practice: Beliefs, Attitudes, Knowledge, and Behaviors of Physical Therapists." *Physical Therapy* 83 (9): 786–805.

Joyner, B.E., and D. Payne. 2002. "Evolution and Implementation: A Study of Values, Business Ethics and Corporate Social Responsibility." *Journal of Business Ethics: JBE* 41 (4): 297–311.

Kreuter, F., S. Presser, and R. Tourangeau. 2008. "Social Desirability Bias in CATI, IVR, and Web Surveys The Effects of Mode and Question Sensitivity." *Public Opinion Quarterly* 72 (5): 847–65.

Lamb, S., M.R. Greenlick, and D. McCarty. 1998. *Bridging the Gap Between Practice and Research:: Forging Partnerships with Community-Based Drug and Alcohol Treatment*. Washington D.C.: National Academies Press.

Le May, A., A. Mulhall, and C. Alexander. 1998. "Bridging the Research–Practice Gap: Exploring the Research Cultures of Practitioners and Managers." *Journal of Advanced Nursing* 28 (2): 428–37.

Mason, W., and S. Suri. 2012. "Conducting Behavioral Research on Amazon's Mechanical Turk." *Behavior Research Methods* 44 (1): 1–23.

Mayer, R.E. 2004. "Should There Be a Three-Strikes Rule against Pure Discovery Learning?" *The American Psychologist* 59 (1): 14.

McAlister, F.A., I. Graham, G.W. Karr, and A. Laupacis. 2001. "Evidence-Based Medicine and the Practicing Clinician." *Journal of General Internal Medicine* 14 (4): 236–42.

Melnyk, B.M., E. Fineout-Overholt, N. Fischbeck Feinstein, H. Li, L. Small, L. Wilcox, and R. Kraus. 2004. "Nurses' Perceived Knowledge, Beliefs, Skills, and Needs Regarding Evidence-Based Practice: Implications for Accelerating the Paradigm Shift." *Worldviews on Evidence-Based Nursing / Sigma Theta Tau International, Honor Society of Nursing* 1 (3): 185–93.

Michie, S., M. Johnston, C. Abraham, R. Lawton, D. Parker, A. Walker, and "Psychological Theory" Group. 2005. "Making Psychological Theory Useful for Implementing Evidence Based Practice: A Consensus Approach." *Quality & Safety in Health Care* 14 (1): 26–33.

Morgan, G. 2006. *Images of Organization*. Updated edition. Thousand Oaks: SAGE Publications, Inc.

Mutch, A. 1997. "Information Literacy: An Exploration." *International Journal of Information Management* 17 (5): 377–86.

Nolan, J.M., P. Wesley Schultz, R.B. Cialdini, N.J. Goldstein, and V. Griskevicius. 2008. "Normative Social Influence Is Underdetected." *Personality & Social Psychology Bulletin* 34 (7): 913–23.

Nutley, S.M., P.C. Smith, and T.O.H. Davies. 2000. *What Works?: Evidence-Based Policy and Practice in Public Services*. Bristol: The Policy Press.

Nutt, P.C. 1993. "The Identification of Solution Ideas during Organizational Decision Making." *Management Science* 39 (9): 1071–85.

———. 1999. "Surprising but True: Half the Decisions in Organizations Fail." *The Academy of Management Executive (1993-2005)* 13 (4): 75–90.

O'Donnell, C.L. 2008. "Defining, Conceptualizing, and Measuring Fidelity of Implementation and Its Relationship to Outcomes in K–12 Curriculum Intervention Research." *Review of Educational Research* 78 (1): 33–84.

Pfeffer, J., and R.I. Sutton. 2006a. "Evidence-Based Management." *Harvard Business Review* 84 (1): 62.

———. 2006b. *Hard Facts, Dangerous Half-Truths, and Total Nonsense: Profiting from Evidence-Based Management*. Cambridge: Harvard Business Press.

Podsakoff, P.M., S.B. MacKenzie, J.Y. Lee, and N.P. Podsakoff. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies." *The Journal of Applied Psychology* 88 (5): 879.

Pondy, L.R., and I.I. Mitroff. 1979. "Beyond Open System Models of Organization." *Research in Organizational Behavior* 1 (1): 3–39.

Ramos, K.D., S. Schafer, and S.M. Tracz. 2003. "Validation of the Fresno Test of Competence in Evidence Based Medicine." *BMJ* 326 (7384): 319–21.

R Core Team. 2015. "R: A Language and Environment for Statistical Computing." Vienna, Austria: R Foundation for Statistical Computing.

Reay, T., W. Berta, and M. Kazman Kohn. 2009. "What's the Evidence on Evidence-Based Management?" *The Academy of Management Perspectives* 23 (4): 5–18.

Roest, A.M., P. de Jonge, C.D. Williams, Y.A. de Vries, R.A. Schoevers, and E.H. Turner. 2015. "Reporting Bias in Clinical Trials Investigating the Efficacy of Second-Generation Antidepressants in the Treatment of Anxiety Disorders: A Report of 2 Meta-Analyses." *JAMA Psychiatry* 72 (5): 500–510.

Rosseel, Y. 2012. "Lavaan: An R Package for Structural Equation Modeling." *Journal of Statistical*. http://www.doaj.org/doaj?func=fulltext&aId=1325391.

Rosswurm, M.A., and J.H. Larrabee. 1999. "A Model for Change to Evidence-Based Practice." *Image--the Journal of Nursing Scholarship* 31 (4): 317–22.

Rousseau, D.M. 2006. "Is There Such a Thing as 'Evidence-Based Management'?" *Academy of Management Review* 31 (2): 256–69.

Rousseau, D.M., and S. McCarthy. 2007. "Educating Managers from an Evidence-Based Perspective." *Academy of Management Learning & Education* 6 (1): 84–101.

RStudio Team. 2015. "RStudio: Integrated Development Environment for R." Boston, MA: RStudio, Inc.

Rutkowski, A., C. Saunders, M. Wiener, and R.J.A.M. Smeulders. 2013. "Intended Usage of a Healthcare Communication Technology: Focusing on the Role of IT-Related Overload," November. http://aisel.aisnet.org/icis2013/proceedings/HumanBehavior/5/.

Rynes, S.L., A.E. Colbert, and K.G. Brown. 2002. "HR Professionals' Beliefs about Effective Human Resource Practices: Correspondence between Research and Practice." *Human Resource Management* 41 (2): 149–74.

Sanders, K., M. van Riemsdijk, and B. Groen. 2008. "The Gap between Research and Practice: A Replication Study on the HR Professionals' Beliefs about Effective Human Resource Practices." *The International Journal of Human Resource Management* 19 (10): 1976–88.

Schriesheim, C.A., K.J. Powers, T.A. Scandura, C.C. Gardiner, and M.J. Lankau. 1993. "Improving Construct Measurement in Management Research: Comments and a Quantitative Approach for Assessing the Theoretical Content Adequacy of Paper-and-Pencil Survey-Type Instruments." *Journal of Management* 19 (2): 385–417.

Sehon, S.R., and D.E. Stanley. 2003. "A Philosophical Analysis of the Evidence-Based Medicine Debate." *BMC Health Services Research* 3 (1): 14.

Sharda, Ramesh, Steve H. Barr, and J.C. McDonnell. 1988. "Decision Support System Effectiveness: A Review and an Empirical Test." *Management Science* 34 (2): 139–59.

Smircich, L. 1983. "Concepts of Culture and Organizational Analysis." *Administrative Science Quarterly* 28 (3): 339–58.

Sparks, P., C.A. Guthrie, and R. Shepherd. 1997. "The Dimensional Structure of the Perceived Behavioral Control Construct." *Journal of Applied Social Psychology* 27 (5): 418–38.

Starkey, K., and P. Madan. 2001. "Bridging the Relevance Gap: Aligning Stakeholders in the Future of Management Research." *British Journal of Management* 12: S3–26.

Staw, B.M., and L.D. Epstein. 2000. "What Bandwagons Bring: Effects of Popular Management Techniques on Corporate Performance, Reputation, and CEO Pay." *Administrative Science Quarterly* 45 (3): 523–56.

Stewart, R. 2002. *Evidence-Based Management: A Practical Guide for Health Professionals*. Abingdon U.K.: Radcliffe Publishing.

Sutton, B. 2006. "Management Advice: Which 90% Is Crap." *Change This*. http://changethis.com/manifesto/23.90PercentCrap/pdf/23.90PercentCrap.pdf.

Terwee, C. 2007. "Quality Criteria Were Proposed for Measurement Properties of Health Status Questionnaires." *Journal of Clinical Epidemiology* 60: 34–42.

Tsang, E.W.K., and K.M. Kwan. 1999. "Replication and Theory Development in Organizational Science: A Critical Realist Perspective." *Academy of Management Review. Academy of Management* 24 (4): 759–80.

Wachter, R.M., and P.J. Pronovost. 2006. "The 100,000 Lives Campaign: A Scientific and Policy Review." *Joint Commission Journal on Quality and Patient Safety / Joint Commission Resources* 32 (11): 621–27.

Walshe, K., and T.G. Rundall. 2001. "Evidence-Based Management: From Theory to Practice in Health Care." *The Milbank Quarterly* 79 (3): 429–57.

Warwick, D.P., and C.A. Lininger. 1975. *The Sample Survey: Theory and Practice*. McGraw-Hill.

Webb, Thomas L., and Paschal Sheeran. 2006. "Does Changing Behavioral Intentions Engender Behavior Change? A Meta-Analysis of the Experimental Evidence." *Psychological Bulletin* 132 (2): 249.

Weick, K.E., K.M. Sutcliffe, and D. Obstfeld. 2005. "Organizing and the Process of Sensemaking." *Organization Science* 16 (4): 409–21.

Wenger, E., R.A. MacDermott, and W.M. Snyder. 2002. *Cultivating Communities of Practice: A Guide to Managing Knowledge*. Cambridge: Harvard Business Press.

World Health Organization. 2013. "Process of Translation and Adaptation of Instruments," August 7. http://www.who.int/substance_abuse/research_tools/translation/en/.

APPENDICES

Appendix A: Institutional Review Board Approval

Oklahoma State University Institutional Review Board

Date:	Monday, November 02, 2015
IRB Application No	BU1558
Proposal Title:	Exec PhD ARP-Project -- a Mindful Service (study 3)

Reviewed and Processed as: Expedited

Status Recommended by Reviewer(s): Approved   Protocol Expires: 11/1/2016

Principal Investigator(s):

Michiel Bosman
Agoraweg 2, 8224BX
Lelystad, Netherlands,

Julian Craig Wallace
OSU Tulsa 306 N. Hall
Tulsa, OK 74106

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☐ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval. Protocol modifications requiring approval may include changes to the title, PI advisor, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of the research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Dawnett Watkins 219 Scott Hall (phone: 405-744-5700, dawnett.watkins@okstate.edu).

Sincerely,

Hugh Crethar, Chair
Institutional Review Board

Dear FIRSTNAME, Beste FIRSTNAME,

As you may have heared I am nearing the final stages of my PhD research (Executive PhD in Business). For my dissertation I need to survey 40 teams (one team leader/manager and 4-10 employees). My research will help measuring leadership climate and the quality of the decision making process - both in healthcare organisations (which is my background) and in business in general.

A number of teams have volunteered; I now need one last batch to finish this project. To join, please follow the below link and enter names/email addresses of your team members (a team consists of one leader/manager and 4-10 employees). In a couple of days they will receive an email invitation to participate in the online survey, which will take them 10-15 minutes.

FIRSTNAME, your help in my final study is essential. I really appreciate your effort!

Follow this link to the form to submit your team:
[PASTE LINK HERE]

Or copy and paste the URL below into your internet browser:
[PASTE LINK HERE]

Once again, I really appreciate your help in wrapping up this study!

Feel free to email me with suggestions/comments,

Yours,

Michiel

Michiel Bosman MD
https://www.linkedin.com/in/mbosman
michiel.bosman@okstate.edu
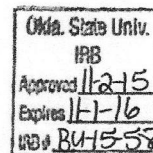
PARTICIPANT INFORMATION

OKLAHOMA STATE UNIVERSITY

Title: Work related questionnaires

Investigator: Michiel Bosman MD, Oklahoma State University

Purpose: The purpose of the research study is to study perceptions of employees and managers regarding jobs.

What to Expect: This research study is administered online. If you decide to participate, you will complete several questionnaires, relating to experiences and attitudes in the workplace. All information you provide will remain confidential. It should take you about 15-20 minutes to complete.

Risks: There are no risks associated with this project which are expected to be greater than those ordinarily encountered in daily life.

Benefits: You may gain an appreciation and understanding of how research is conducted.

Compensation: You will not receive a financial compensation.

Your Rights and Confidentiality: Your participation in this research is voluntary. There is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time, without penalty. Once all data have been collected, it will not be possible to withdraw your data.

Confidentiality: All information about you and your responses will be confidential. No one other than the researchers will know your responses. Neither coworkers nor your employer will know your responses. Research records will be stored securely and only researchers and individuals responsible for research oversight will have access to the records. The data will be stored with Michiel Bosman MD (Oklahoma State University). The computer program we will use to collect the data is Qualtrics. Information collected through your participation may be published in a professional journal and/or presented at a professional meeting, etc. and if so, only aggregate data will be presented.

Contacts: You may contact the researcher at the following address and phone number, should you desire to discuss your participation in the study and/or request information about the results of the study: Michiel Bosman MD, Dept. of Management, Spears School of Business, Oklahoma State University, Stillwater, OK 74078, or osuresearch1@gmail.com. If you have questions about your rights as a research volunteer, you may contact Dr. Hugh Crethar, IRB Chair at 223 Scott Hall, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu.

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Updated: August 2014

Okla. State Univ.
IRB
Approved 1-2-15
Expires 1-1-16
IRB# BU1558
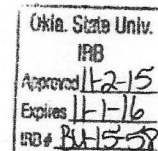
If you choose to participate: Please, click NEXT if you choose to participate. By clicking NEXT, you are indicating that you freely and voluntarily agree to participate in this study and you also acknowledge that you are at least 18 years of age.
It is recommended that you print a copy of this consent page for your records before you begin the study by clicking below.

- Next
- No thanks
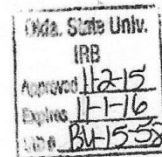
Appendix B: Survey Development

Attitudes

The EBMAS Attitudes scale (developed previously by the investigator based on the work of

Gregory Aarons, UCSD) consists of four subscales: appeal, openness, requirements and divergence.

As in previous studies, the statistical strength of appeal, openness and requirements is robust, and

divergence is slightly lacking. In line with those previous studies, I have decided to keep divergence

in. EBMAS Attitudes Total is computed by summing up the four EBMAS Attitudes sub-factors.

Table A1. EBMAS Attitudes Subscales and Total Score

	χ^2	DF	CFI	TLI	RMSEA	90% CI	SRMR
Appeal	1.954	2	1.00	1.00	0.000	0 – 0.14	0.016
Openness	1.514	2	1.00	1.00	0.000	0 – 0.13	0.010
Requirements	0.000	0	1.00	1.00	0.000	0 – 0	0.000
Divergence	18.575	2	0.88	0.63	0.200	0.126 – 0.293	0.079
Total score	3.515	2	0.97	0.92	0.062	0.000 – 0.166	0.032

N = 199

Actual Attitudes

An attempt to create a survey measuring actual attitudes toward Evidence-Based Management

was not successful. The survey contained the following four questions.

- Evidence-Based Management can make me make better decisions.

- Evidence-Based Management can make me more effective in my work.

- Evidence-Based Management is not relevant (reverse scored).

- Evidence-Based Management is useless (reverse scored).

Interestingly, the only statistically significant result was when I did *not* reverse score the *EBMgmt is*

useless item (results not shown). This suggests that survey takers see the value of EBMgmt, but do

not see themselves using it anyway. The *actual attitudes* survey has been omitted from the results.

Behavioral Value

An alternative survey (Behavioral Value) was developed, measuring the value a respondent gives

to a number of behaviors on a 5 point Likert scale (very bad … very good):

- a streamlined, efficient decision making process, is ...

- saving time and effort, is ...

- saving money, is ...

- boosting morale with stakeholders because of their involvement in the decision making process, is …

Behavioral value and EBMAS Attitudes Total have a significant correlation of 0.52 ($p < .05$).

Table B2. Behavioral Values

	χ^2	DF	CFI	TLI	RMSEA	90% CI	SRMR
Behavioral Value	2.563	2	0.997	0.992	0.038	0 – 0.15	0.020

N = 199

Subjective Norm

The Subjective Norm scale consists of two subscales: Normative Behavior and Social Pressure . Two other subscale were tested and had good statistics, but did not add value to the overall scale (*When it comes to the way I work, I want to be like ... / When it comes to the way I work, I want to do what ... think I should do*).

Normative Behavior

Please answer each of the following questions by selecting the option that best describes how people around you use evidence-based management in their decision making process (5 point Likert scale; definitely true … definitely false):

- Most of my co-workers (use EBMgmt in their decision making process)

- Most of my bosses/managers ...

- Most of my staff/employees ...

- Most of my family and friends …

Social Pressure

How much do the following people think that you should be using evidence-based management? (strongly disagree … strongly agree)

- Most of my co-workers …

- Most of my bosses/managers ...

- Most of my staff/employees ...

- Most of my family and friends …

Convergent and Divergent Validity

We could find no significant correlation between the Subjective Norm total score and either

EBMAS Climate or IPIP Self-Sufficiency.

Table B3. Subjective Norm

	χ^2	DF	CFI	TLI	RMSEA	90% CI	SRMR
Subjective Norm	2.213	2	0.999	0.996	0.023	0 – 0.145	0.021
Normative Behavior	2.235	2	0.999	0.998	0.024	0 – 0.145	0.017
Social Pressure	5.572	2	0.987	0.961	0.095	0 – 0.192	0.024
Social Norm (Total Score)	0.000	0	1.000	1.000	0.000	0 – 0	0.000

N = 199

Perceived Behavioral Control

For this scale, four subscales were developed. As it did not add to the total scale, the perceived

difficulty subscale was not used. The remaining three subscales were: Perceived Control, Self-

Assessed Research Skills and Self-Assessed Organizational Skills.

Perceived Control

Using evidence-based management in my work will be easier if we have ... (5 point Likert scale;

strongly disagree … strongly agree):

- ... open communication in my team

- ... training about the topic

- ... access to guides/data

- ... seen it work in other organizations

- ... seen it work in other teams in my organization

- ... access to a manager/expert with experience in evidence-based management

Self-Assessed Research Skills

I am confident in my ability to ... (5 point Likert scale; strongly disagree … strongly agree):

- Run experiments in my organization

- Evaluate the decision making process

- Follow research based guidelines.

- Search for research evidence

- Use the library to locate information

- Review research evidence

- Use research evidence to change practice

Self-Assessed Organizational Skills

I am confident in my ability to ... (5 point Likert scale; strongly disagree … strongly agree):

- Search for organizational information

- Review organizational information

- Use organizational information to change practice

- Identify the implications of organizational information for my own practice

Table B4. Perceived Behavioral Control

	χ^2	DF	CFI	TLI	RMSEA	90% CI	SRMR
Perceived Control	22.190	9	0.973	0.955	0.086	0.041 – 0.132	0.032
Self-Assessed Research Skills	51.920	14	0.943	0.914	0.117	0.084 – 0.151	0.043
Self-Assessed Organizational Skills	4.928	2	0.989	0.967	0.086	0 – 0.185	0.024
Perceived Behavioral Control	23.755	2	1.000	1.000	0.000	0 – 0	0.000

N = 199

Evidence-Based Management Behavior

This scale consists of two subscales: Self-Assessed Research Behavior and Self-Assessed

Practice Behavior.

Self-Assessed Research Behavior

In your day to day work, when you have to make a decision, how often do you ... (5 point Likert scale; never … always):

- Run experiments in your organization.

- Follow research based guidelines.

- Search for research evidence.

- Review research evidence.

- Use research evidence to change practice.

Self-Assessed Organizational Behavior

In your day to day work, when you have to make a decision, how often do you ... (5 point Likert scale; never … always):

- Search for organizational information.

- Review organizational information.

- Use organizational information to change practice.

- Identify the implications of organizational information for your own practice.

Table B5. Evidence-Based Management Behavior

	χ^2	DF	CFI	TLI	RMSEA	90% CI	SRMR
Self-Assessed Research Behavior	25.300	5	0.956	0.912	0.143	0.091 – 0.200	0.045
Self-Assessed Organizational Behavior	8.859	2	0.977	0.932	0.131	0.052 – 0.225	0.028

N = 199

Self Assessed Recent Evidence-Based Management Behavior

During the past 4 weeks, how often did you use the evidence-based management approach? (5-point Likert scale; never … always). This one item question was the item used as a self report for actual use of evidence-based management practice.

Intention to use EBMgmt

The intention to use EBMgmt was measured using a one item question, again on a five point Likert scale (strongly disagree … strongly agree):

- I intend to use evidence-based management in my day to day work during the next three months.

Evidence-Based Management Climate Scales

Two Evidence-Based Management Climate Scales were developed, based on the original EBMAS Attitude Scale. Even though only a small group of respondents self-identified as non-manager in the Mechanical Turk sample, I have been able to validate both the Leadership and the Employee scale. As with the EBMAS Attitude Scale, the divergence subscale was statistically weaker than the other subscales. Again, in line with previous studies, I have decided to keep divergence in.

EBMAS Leadership Climate Scale

*The following questions ask about **your team's** feelings about using new types of management tools/approaches. (…) Indicate the extent to which **your team** agrees with each item using the following scale.* (5 point Likert scale; not at all … to a very great extent).

Table B6. EBMAS Leadership Climate Scale

	χ^2	DF	CFI	TLI	RMSEA	90% CI	SRMR
Appeal	1.123	2	1.000	1.003	0.000	0 – 0.134	0.002
Openness	0.021	2	1.000	1.006	0.000	0 – 0	0.000
Requirements	0.000	0	1.000	1.000	0.000	0 – 0	0.000
Divergence	19.854	2	0.970	0.909	0.239	0.151 – 0.340	0.024
Total score	7.063	2	0.993	0.980	0.127	0.035 – 0.235	0.009

N = 156

EBMAS Employee Climate Scale

*The following questions ask about **your supervisor's** feelings about using new types of management tools/approaches. (…) Indicate the extent to which **your supervisor** agrees with each item using the following scale.* (5 point Likert scale; not at all … to a very great extent).

Table B7. EBMAS Employee Climate Scale

	χ^2	DF	CFI	TLI	RMSEA	90% CI	SRMR
Appeal	1.923	2	1.000	1.001	0.000	0 – 0.298	0.013
Openness	3.440	2	0.991	0.973	0.129	0 – 0.355	0.022
Requirements	0.000	0	1.000	1.000	0.000	0 –0	0.000
Divergence	9.399	2	0.878	0.635	0.293	0.124 –0.493	0.075
Total score	2.873	2	0.992	0.977	0.101	0 –0.336	0.025

N = 43

Convergent and Divergent Validity

Convergent validity was assessed comparing the EBMAS Climate Total score to the TCI Innovation subscale. It had a weak but significant correlation in the full group and manager subgroup (0.17 vs 0.22), but no significant correlation in the (smaller) non-manager group. Divergent validity was assessed comparing the same to the IPIP Self-Sufficiency scale, which as predicted had no significant correlation in the full group or the subgroups.

Table B7. Correlation Matrix

Survey code name in dataset	Survey Name	Require-ments	Appeal	Openness	Diver-gence	Norm-ative Beliefs	Social Norm	Social Pressure	Social Pressure 2	Symbolic Support	Active Support	Perceived Control	Perceived Difficulty	Self-Assessed Research Skills
ebmas.a.req	Requirements													
ebmas.a.app	Appeal	0.46***												
ebmas.a.ope	Openness	0,13	0.22**											
ebmas.a.div	Divergence	0.21**	0,11	0,01										
sn.nb	Normative beliefs	0,05	-0,02	0,12	-0,01									
sn.sn	Social norm	0,11	0,05	0,14	0.15*	0.17*								
sn.sp	Social pressure	0	-0,03	0.20**	0	0.57***	0.15*							
sn.sp2	Soial pressure 2	0.19**	0.19**	0.23**	0.18**	0.16*	0.55***	0.20**						
sn.ss	Symbolic support	0,01	0,09	-0,08	0.18*	-0,06	-0,14	-0,08	-0,13					
sn.as	Active support	0.17*	0,09	0,08	0,03	0.26***	0,1	0.23**	0.14*	0,01				
perc.con	Perceived control	0.21**	0.31***	0.27***	0.26***	0,1	0.30***	0.28***	0.43***	-0.16*	0.18**			
perc.dif	Perceived difficulty	0.28***	0.30***	-0,07	0,14	-0.18*	0,08	-0,08	0.22**	-0,03	-0,11	0.33***		
skill.self.res	Self-assessed research skills	0.14*	0,11	0.18*	0,1	0,01	0,13	0,02	0,12	0.26***	0.34***	0.18**	-0,01	

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skill.self.org	Self-assessed organizational skills	0.20**	0.18*	0.19**	0,05	0,03	0,13	0,03	0.16*	0.26***	0.34***	0.20**	0,02	0.84***
behav.self.res	Self-assessed research behavior	-0,04	-0,02	0.22**	-0,03	0.32***	-0,02	0.31***	0,02	-0,02	0.33***	0,02	-0.30***	0.34***
behav.self.org	Self-assessed organizational behavior	0,01	0,05	0.29***	0,04	0.25***	0,1	0.30***	0,11	-0,11	0.29***	0.18*	-0.20**	0.27***
ebmas.a.total	EBMAS Attitude (total score)	0.75***	0.70***	0.54***	0.51***	0,06	0.18*	0,06	0.32***	0,07	0.16*	0.41***	0.26***	0.22**
ipip.ss	IPIP Self Sufficiency	0,07	0,13	0.15*	-0,14	-0,02	-0,11	-0,1	-0,03	0.20**	0,07	0,03	-0,05	0.21**
tci.innov	TCI Innovation	0,13	0.14*	0.17*	0,03	0.19**	0.22**	0,02	0.15*	0,03	0.34***	0.17*	-0,07	0.40***
behav.belief	Behavioral belief	0,09	0,08	0.40***	0.23***	0.31***	0.24***	0.41***	0.37***	-0,02	0.20**	0.41***	-0,08	0.14*
behav.value	Behavioral value	0.40***	0.48***	0.27***	0.16*	0,1	0,11	0.17*	0.30***	0,03	0.18**	0.41***	0.24***	0.32***
behav.past	Recent behavior	-0,07	-0,02	0.15*	-0,09	0.49***	0,04	0.40***	0,05	-0.22**	0.25***	-0,01	-0.14*	-0,03
att.act	Actual attitude	-0,13	-0,1	-0,03	-0,11	0,06	0,07	0,1	-0,01	-0,02	0,07	0,01	-0,05	0,04
ipip.hap	IPIP happiness	0.16*	0,04	0,03	0,08	0,1	0,1	-0,04	-0,04	0.17*	0.26***	-0,01	-0.14*	0.43***

		Self-assessed organizational skills	Self-assessed research behavior	Self-assessed organizational behavior	EBMAS Attitude (total score)	IPIP Self Sufficiency	TCI Innovation	Behavioral belief	Behavioral value	Recent behavior	Actual attitude	IPIP happiness	Perceived behavioral control	Subjective norm
pbc	Perceived behavioral control	0.24***	0.26***	0.27***	0.18*	0,06	0.24***	0.14*	0.31***	0.15*	0.37***	0.60***	0.14*	0.86***
sn	Subjective norm	0,07	0	0.21**	0,05	0.83***	0.56***	0.79***	0.39***	-0,12	0.27***	0.30***	-0,09	0,07
intention	Intention	-0,03	0,03	0.18*	0,1	0.44***	-0,02	0.45***	0,12	-0,04	0.17*	0.14*	-0,11	0,07
ebmas.a.req	Requirements													
ebmas.a.app	Appeal													
ebmas.a.ope	Openness													
ebmas.a.div	Divergence													
sn.nb	Normative beliefs													
sn.sn	Social norm													
sn.sp	Social pressure													
sn.sp2	Soial pressure 2													
sn.ss	Symbolic support													
sn.as	Active support													

perc.con	Perceived control							
perc.dif	Perceived difficulty							
skill.self.res	Self-assessed research skills							
skill.self.org	Self-assessed organizational skills							
behav.self.res	Self-assessed research behavior	0.24***						
behav.self.org	Self-assessed organizational behavior	0.27***	0.74***					
ebmas.a.total	EBMAS Attitude (total score)	0.25***	0,05	0.15*				
ipip.ss	IPIP Self Sufficiency	0.35***	-0,06	0,02	0,09			
tci.innov	TCI Innovation	0.41***	0.26***	0.25***	0.19**	0.27***		
behav.belief	Behavioral belief	0,12	0.20**	0.24***	0.31***	-0,04	0.15*	
behav.value	Behavioral value	0.36***	0,06	0,14	0.52***	0.22**	0.24***	0.37***

behav.past	Recent behavior	-0,09	0.33***	0.24***	-0,02	-0.16*	0,05	0.17*	-0,09					
att.act	Actual attitude	-0,02	0.15*	0,1	-0.15*	-0.15*	-0,03	0,07	-0.21**	0,1				
ipip.hap	IPIP happiness	0.44***	0,11	0,04	0,13	0.34***	0.33***	0,05	0.20**	-0,09	-0,11			
pbc	Perceived behavioral control	0.87***	0.25***	0.31***	0.38***	0.25***	0.42***	0.29***	0.47***	-0,06	0,01	0.37***		
sn	Subjective norm	0,08	0.29***	0.30***	0,13	-0,1	0.20**	0.44***	0.17*	0.44***	0,11	0,07	0.19**	
intention	Intention	0,02	0.26***	0.25***	0,1	0	0,11	0.29***	0.16*	0.39***	-0,05	0,05	0,1	0.41***

APPENDIX C: EVIDENCE-BASED MANAGEMENT SCALE-ATTITUDE

Please indicate your agreement with the items: 0 = not at all; 1 = to a slight extent; 2 = to a moderate

extent 3 = to a great extent; 4 = to a very great extent

Item	Question	0	1	2	3	4
1.	I like to use new types of management tools/approaches for my organization					
2.	I am willing to try new types of management tools/approaches, even if I have to follow a protocol					
3.	I know better than academic researchers how to manage my organization					
4.	I am willing to use new and different types of management tools/approaches developed by researchers					
5.	Research based management tools/approaches are not useful in practice					
6.	Practical experience is more important than using structured management tools/approaches					
7.	I would not use structured management tools/approaches					
8.	I would try a new management tool/approach, even if it was very different from what I am used to do					
	For questions 9-15; if you received training in a management tool/approach that was new to you, how likely would you be to adopt it if:					
9.	It was intuitively appealing?					
10.	It 'made sense' to you?					
11.	It was required by your supervisor?					
12.	It was required by your organization					
13.	It was required by government					
14.	It was being used by colleagues who were happy with it?					
15.	You felt you had enough training to use it correctly?					

VITA

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