DISSERTATION

THE IMPACT OF ALIGNMENT BETWEEN ORGANIZATIONAL CLIMATES FOR SAFETY, PRODUCTIVITY, AND QUALITY

Submitted by

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In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Spring 2014

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ABSTRACT

THE IMPACT OF ALIGNMENT BETWEEN ORGANIZATIONAL CLIMATES FOR SAFETY, PRODUCTIVITY, AND QUALITY

With a sample of 204 construction workers, the present study assessed how the alignment and misalignment between safety, productivity, and quality climates was related to important individual and organizational outcomes. All three climates were related to safety, productivity, and quality outcomes. An alignment between climates, and a more positive perception of each, led to beneficial outcomes for the individual and the organization. However, a greater misalignment between the outcomes led to poorer health and decreased productivity and quality. Better perceptions of leadership were associated with more positive safety, productivity, and quality climates. These findings are important for both science and practice. Rather than creating silos for these key organizational goals, academics and practitioners should take a more holistic perspective. An understanding of the interaction between safety, productivity, and quality climates, and taking an effort to align these three goals, can maximize organizational success.

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INTRODUCTION

Some of the most common metrics of organizational success are safety, productivity, and quality. However, organizations may perceive a tension between these goals, and optimizing the relationship among the three may be difficult. Employees that sense this tension may feel pressured to prioritize safety, productivity, or quality over one another, depending on what they perceive the organization values. The value for each of these in relation to one another can influence employees to respond in different ways. More specifically, employees may behave differently when these goals are in alignment than when one is valued over another. In the present study, I focus on how organizational values are manifested through three specific climates: safety climate, productivity climate, and quality climate, and assess how the congruence or incongruence between them is related to important individual and organizational outcomes. In addition, I explore the role of transformational leadership in creating these climates, and how these climates may mediate the relationships between leadership and the outcomes.

Organizations show their values for safety, productivity, and quality by creating climates that support them. Organizational cultures represent the shared values among individuals regarding the perceived importance of specific organizational goals (Schein, 1990), and organizational climates represent the measurement of perceptions of these values (James et al., 2008). In the cases where these perceptions are not shared amongst a group, the term *psychological climate* is used to represent an individual's perception of the overall climate (James et al., 2008; James, Hater, Gent, & Bruni, 1978; James & Sells, 1981). Through these climates, employees get a sense of how important each of these goals are. With this understanding, employees then make judgments and decisions regarding how to behave at work (Glick, 1985; Payne & Pugh, 1976; Schneider & Reichers, 1983).

When work demands and pressures increase, employees must prioritize their actions by making decisions as to what is more important to the organization. In doing so, the climate of an organization can impact various individual and organizational outcomes (e.g., Aryee, Walumbwa, Seidu, & Otaye, 2012; Payne & Pugh, 1976). To provide an example, if productivity is valued over safety, workers may decide to ignore safety procedures and refuse to wear personal protective equipment in an effort to remain comfortable and get the job done as quickly as possible (e.g., Clarke, 2006; Zohar, 2010). On the other hand, if quality is valued over productivity, employees may spend all of their time perfecting the product they are making or the service they are providing without paying attention to the actual quantity of work that is being completed (e.g., Brewer & Ridgway, 1998). An alignment of these values, however, could mean that when pressures increase, employees prioritize their actions but do so in a way that doesn't completely ignore one value over another. Rather, they may focus on how to work in a manner that is consistent with two or all three values (MacCormick & Parker, 2010). Thus, it is important to understand not only how organizations can promote these values, but also to what extent the agreement or disagreement between them affects individual and organizational outcomes. To explore this further, I will begin by examining the importance of each of these climates individually.

Safety Climate

Employees that perceive that their organization cares about safety are more likely to care about safety themselves (Christian, Bradley, Wallace, & Burke, 2009b). This is the cornerstone behind establishing a positive safety climate in an organization. First conceptualized by Zohar

(1980), safety climate represents employee perceptions of the relative importance of safety. The level of safety climate in an organization is a strong predictor of important safety and health outcomes such as accident rates, injuries, overall health, and job satisfaction (Barling, Loughlin, & Kelloway, 2002; Cheyne, Cox, Oliver, & Tomas, 1998; Christian, Bradley, Wallace, & Burke, 2009a; Clarke, 2006; Cooper & Phillips, 2004a; Griffin & Neal, 2000b; Hall, Dollard, Winefield, Dormann, & Bakker, 2013; Huang, Ho, Smith, & Chen, 2006; Kelloway, Mullen, & Francis, 2006b; Mearns, Whitaker, & Flin, 2003; Neal & Griffin, 2006; Probst, Brubaker, & Barsotti, 2008; Smith, Huang, Ho, & Chen, 2006; Zohar, 1980, 2000). In addition to these outcomes, a less studied but nevertheless important outcome of safety climate is work ability. Work ability refers to an employee's perceived ability to complete a job, given the challenges of the job and employee resources (Ilmarinen, Gould, Järvikoski, & Järvisalo, 2008). Organizations that promote the health of employees (as often done in organizations with positive safety climates) have employees with higher perceptions of work ability (Vingård et al., 2009; von Thiele Schwarz & Hasson, 2011). Therefore, developing a value for safety by building a positive safety climate is an effective means of promoting organizational success through positive health and safety outcomes.

Although the critical elements of safety climate are debated amongst researchers (Cooper & Phillips, 2004b; Coyle, Sleeman, & Adams, 1995; Dedobbeleer & Beland, 1991; Vinodkumar & Bhasi, 2009; Zohar, 1980), this literature suggests a few common channels through which safety climate can be developed. The first is through leaders within the company. Management commitment to safety can be established through priorities given to different values. More specifically, when pressures increase, what gets prioritized – one of the values over another, or are they given equal weight? Management commitment can also be established through the rewards provided for specific actions, and the rules enforced day-to-day (e.g., Drury, Broderick, Weidman, & Mozrall, 1999; Hofmann & Morgeson, 2004; Zohar, 2011). Employee involvement in safety-related activities is the second key driver of safety climate. When employees are encouraged to participate and their input is valued in regards to how to improve safety, a positive safety climate can be cultivated (Koningsveld, Dul, Van Rhijn, & Vink, 2005; Schneider & Reichers, 1983). The third way that safety climates can be developed is through the training given to employees about why safety is important and how employees can be safe in their jobs (Cheyne et al., 1998; Probst, 2004). Last, the policies and procedures in place provide a more "formal" means of communicating a value for safety (Burke, 2011; Miles & Perrewé, 2011). Together, these are various examples of how an organization can promote a positive safety climate.

Productivity Climate

Organizations exist to provide a product or service to the larger population, which drives their success and growth. Therefore, it is important that the individuals employed by the organization are contributing to this output. Put simply, productivity climate is the perception that employees have regarding how the organization values productivity. However, it is important to make a distinction between the productivity climate that I refer to and the "high performance work cultures" (HPWC) frequently discussed in management research and practice. HPWC represent a mindset for how to optimally utilize the resources of the organization (Denison, Hooijberg, Lane, & Lief, 2012; Wriston, 2007). Although this is a highly efficient culture, it frequently incorporates many dimensions of organizational performance (as opposed to just productivity), such as quality, innovation, and employee involvement. As the purpose of my paper is to focus on how the agreement or disagreement between safety, productivity, and quality is related to individual and organizational outcomes, I will focus solely on the productivity component. More specifically, the present study will assess each climate individually and compare the levels of each in relation to outcomes, rather than past research on HPWC that uses a single integrated measure of culture to predict outcomes (e.g., Aryee et al., 2012; Liao, Toya, Lepak, & Hong, 2009). By separating these climates out, I can assess how relative levels of each of them relate to the outcomes.

Although there is quite a bit of literature on HPWC (e.g., Aryee et al., 2012; Cappelli & Neumark, 1999; Godard, 2004; Huselid, 1995), there is relatively little on what makes a "productivity climate" (e.g., Akin & Hopelain, 1986; Kopelman, Brief, & Guzzo, 1990). In addition, this literature frequently provides anecdotal evidence on the characteristics of organizations with HPWC, rather than empirical evidence (e.g., Fairhurst, 2008; Mosley & Patrick, 2011; Wriston, 2007). However, this evidence can be used to suggest how organizations may communicate a value for productivity (Pritchard & Karasik, 1973). Both HPWC and productivity climates can result in increased employee performance, and more specifically, productivity and organizational citizenship behaviors (e.g., Aryee et al., 2012; Cappelli & Neumark, 1999; Kopelman et al., 1990; Liao et al., 2009). Organizational citizenship behaviors (OCB) represent employee behaviors that are discretionary in nature; they are not formally rewarded by the organization, and they promote the effective functioning of an organization (Organ, 1988).

The four avenues discussed previously for safety climate can also apply here (Akin & Hopelain, 1986). The first means of communicating a value for productivity is through leadership. Leaders that promote a focus on quantity elicit greater performance from individuals (Brewer & Ridgway, 1998; Tastard, 2012). Second, a climate for productivity can also be enhanced through employee involvement. When employees are given a chance to provide their opinions on how to be more productive, they are likely to see productivity as valued (Cappelli & Neumark, 1999; Wriston, 2007). Formal policies and procedures, as well as the training given to employees, are the third and fourth avenues that build a positive productivity climate. Training is perhaps the most widely used strategy, as the majority (if not all) of organizations train their employees on how to do their jobs (Tastard, 2012). Furthermore, when considering the policies and procedures in place for promoting a value for productivity, it is often clear how additional productivity is rewarded (for example through bonuses, Mosley & Patrick, 2011), and how a decrease in productivity may be punished (for example by providing additional training, or if serious enough, through demotion or firing; Wriston, 2007). Therefore, although there is limited research on the components of a productivity climate, it is reasonable to expect that these four components could apply to both safety and productivity climates.

Quality Climate

In order for organizations to remain competitive, they must not only generate high levels of output, but also ensure a quality product or service (MacCormick & Parker, 2010). A high level of productivity is seemingly useless if that output is of poor quality, as this poor quality will likely hurt that organization's reputation, sales, and ultimately their bottom line. As suggested plainly by Deal (1991), "the core of competition is quality…cost is important, but quality at a reasonable cost represents value" (p. 173). An organizational value for quality sets up a cognitive framework that guides the attitudes and behaviors of employees in relation to the quality of their work (Amundson & Cummings, 1997; Cound, 1992). Therefore, an organizational climate for quality is also necessary for success.

The notion of a climate for quality has been mentioned in a variety of literatures, with many researchers outlining different structures for what quality climate could look like (Harvey

& Stensaker, 2007; Kanji & Wong, 1998; Sinclair & Collins, 1994; Yorke, 2000). However, four distinct themes, similar to those seen in safety and productivity climates, are common throughout this research. First is the importance of leaders and supervisors in establishing the value for quality in the organization (e.g., Adebanjo & Kehoe, 1999; Gordon, 2002; Roberts & Perryman, 2007; Shipton, Armstrong, West, & Dawson, 2008). Second is getting employees involved in the process of making quality a core organizational value. When employees feel like they own part of the process, work together as a team to come up with innovative solutions to improve quality, and contribute diverse opinions, they are more likely to see quality as an important value (e.g., Abraham, Fisher, & Crawford, 2000; Cornell & Herman, 1989; Hildebrandt, Kristensen, Kanji, & Dahlgaard, 1991; Thompson, 1998). Third, it is important for organizations to train on the value of quality and help employees gain knowledge of how to produce a quality product (e.g., Abraham et al., 2000; Johnson, 2000). Fourth, the policies and procedures in place to control quality, and the systems set up to provide standards of quality, contribute the formal aspect of quality culture by outlining what is expected of employees (e.g., Ehlers, 2009; Kanji & Yui, 1997; Sinclair & Collins, 1994).

These four components are common amongst safety, productivity, and quality climates, which may help organizations embody all three values. Developing a parallel structure for safety, productivity, and quality climates creates a framework that allows me to directly compare them. As an example, if I were to compare employee productivity to employee work quality, it would be necessary to standardize my measurement systems, as productivity and quality are most likely not measured using the same scale or criteria. By creating parallel structures between safety, productivity, and quality climate, I am in essence standardizing the measurement such that I can more readily assess what a value for one means in comparison to a value for another.

The Relationships Between These Climates

According to multiple stakeholder theory (Donaldson & Preston, 1995), organizations do not pursue a single criterion; rather, they aim to be effective on several dimensions simultaneously (MacCormick & Parker, 2010; Quinn & Rohrbaugh, 1981). In other words, it is possible for organizations to value safety, quality, and productivity together. Traditional literature on ambidexterity (Duncan, 1976) suggests that organizations must manage conflicting demands by having certain business units focus on one goal while other units focus on another. However, recent research by MacCormick and Parker (2010) suggests that the most effective business units emphasize traditionally "competing" goals simultaneously. Therefore, it seems necessary to focus on the relationships between these three climates. Although much is known about safety, productivity, and quality climates individually, these goals don't exist in isolation, and we have yet to understand how the alignment between these climates is related to important individual and organizational outcomes (Cappelli & Neumark, 1999).

There are three critical ways that the relationships between pairs of climates may impact the outcomes. First, it is possible that the value placed on two climates will be equal. In this case, the organization is promoting two goals simultaneously, and should see increased positive outcomes and decreased negative outcomes as the value for both increases. This is the ideal case when comparing all of the climates to one another, and is similar to the relationship embodied by a HPWC (e.g., Aryee et al., 2012). Organizations should see the most benefit when safety, productivity, and quality climates are valued at similarly high levels. Although HPWC don't traditionally include safety and health aspects, it is reasonable to expect that in the ideal scenario, employees that perform well and produce quality work should also be healthy and safe because they are doing their jobs correctly. Therefore, organizations should see the most benefits when climates are in agreement.

Not all organizations have functional HPWC, and in order to move towards a climate that integrates safety, productivity, and quality, it is necessary to understand how the relationship between these climates affects organizationally relevant outcomes. Thus, I will also examine how a disagreement between climates, or when one is more positive than another, is related to these outcomes. This is the aspect that differentiates the present study from traditional research on HPWC. By measuring the climates individually (rather than as a single climate, as in HPWC literature), I can assess how the disagreement between climates impacts important individual and organizational outcomes. As mentioned earlier, when safety, productivity, and quality are valued at different levels, employees prioritize their actions in terms of which they pay attention to more. Therefore, it is not only important that there may be a disagreement between climates, it is also important to know how the outcomes are affected when one climate is perceived as being valued more than another. To explain further, each pair of climates is discussed in terms of the hypothesized impact on outcomes when they are in agreement, in disagreement, and when one is more positive than the other.

The Relationship Between Safety Climate and Productivity Climate

Research on the relationship between safety and productivity has reached varying conclusions. In some organizations, there is a tension between safety and productivity that leads to a tradeoff as individuals spend more time being safe and less time doing their jobs. Some research does suggest that when workers are more productive, they are also sometimes unsafe (Allen, Slavin, & Bunn, 2007; Beersma et al., 2003; Probst, 2002). More specifically, in the context of safety climate, a study conducted by Wallace and Chen (2006) found that a higher perceived safety climate negatively predicted employee productivity. Therefore, it is possible for the relationship between safety and productivity to be negative. Despite this evidence, there is also some research supporting the opposite notion; that safety and productivity can be mutually enhancing. In certain contexts, safety and productivity could be seen as a unitary performance dimension, such that they are positively related to one another (Viswesvaran, Schmidt, & Ones, 2005), and in other contexts they may be separate dimensions, allowing the relationship between them to be positive or negative (Hofmann & Tetrick, 2003).

The mixed evidence on the relationship between safety and productivity is precisely the reason that it is important to clarify how they are related and how their relationship may impact important outcomes. More specifically, perhaps this mixed evidence is a result of the *climates* for each of these goals (i.e. safety and productivity climate). If the climate for safety and the climate for productivity are in disagreement, it is possible that safety and productivity could be negatively related to one another. However, if the climates for productivity and safety are in agreement, this could lead to a positive relationship between safety and productivity outcomes. An examination of how these climates are related, and how they relate to safety and productivity outcomes, could help bring clarity to this area.

To examine the relationship between safety and productivity climate, I will first consider how the agreement between them is related to the outcomes. In other words, when safety and productivity climates are equal (or close to equal), how does an increased level of each climate influence the outcomes? As mentioned above, it is plausible to expect that values for productivity and safety can be equal. The entire field of human factors and ergonomics is dedicated to just this concept. Ergonomics interventions and redesigns of workstations have resulted in simultaneous organizational benefits – decreased accidents and injuries, increased productivity, increased quality, and decreased costs (Genaidy, Sequeira, Rinder, & A-Rehim, 2009; Goggins, Spielholz, & Nothstein, 2008; Hendrick, 1996). Therefore, my first hypotheses are:

H1: When safety and productivity climate are in agreement, they will be significantly related to organizational outcomes. More specifically, when they are in agreement, a higher level of each will be positively related to employee productivity, quality, and organizational citizenship behaviors.

H2: When safety and productivity climate are in agreement, they will be significantly related to individual outcomes. More specifically, when they are in agreement, a higher level of each will be positively related to employee health, work ability, and job satisfaction, and significantly negatively related to accidents and near misses.

Based on these arguments, it is also reasonable to expect that a disagreement between safety and productivity climates could impact individual and organizational outcomes. When climates are seen as competing, employees must rely on their own judgments to determine which is more important to them, to their supervisor, to their coworkers, and/or to the company (Schneider & Reichers, 1983). This is in line with the results of Wallace and Chen's (2006) study suggesting that when one value is prioritized (e.g., safety climate), it detracts from another (e.g., productivity). If the best possible work environment, wherein productivity, quality, and safety are at ideal levels, presents itself when organizational climates are in alignment at a high level (as hypothesized above), then the more these climates are perceived to be in discord, the more "chaotic" the environment becomes as employees make decisions as to which is valued more, and their behavior is influenced accordingly. Thus,

H3: When safety and productivity climate are in disagreement, they will be significantly related to organizational outcomes. More specifically, a larger discrepancy between the two climates will lead to decreased employee productivity, quality, and organizational citizenship behaviors.

H4: When safety and productivity climate are in disagreement, they will be significantly related to individual outcomes. More specifically, a larger discrepancy between the two climates will lead to decreased employee health, work ability, and job satisfaction, and increased accidents and near misses.

To expand on the previous hypotheses, when safety and productivity climates are in disagreement, the relationship between this disagreement and outcomes may depend on the direction of that discrepancy. When safety is valued over productivity, or when productivity is valued over safety, there may be differential consequences for the individual and the organization. Researchers have certainly established the validity of safety climate as a predictor of workplace safety. Traditionally, safety climate has been proposed as a value for safety *over* competing goals, such as productivity (Zohar, 1980). If this is truly the case, then the evidence supporting the value for safety climate in predicting important safety outcomes (e.g., Christian et al., 2009b; Nahrgang, Morgeson, & Hofmann, 2011) seems logical, as well as the evidence suggesting that safety climate could be negatively related to productivity (Wallace & Chen, 2006). When safety is valued over productivity, this communicates to workers that their well-being is more important than the success of the organization. This will likely result in increased safety as workers recognize the discrepancy in climates, and place more emphasis on staying safe. This could also result in increased job satisfaction and overall health as employees feel more valued and respected. In this sense, it is also possible that employees will engage in the more elective type of performance, OCB, because they feel they are an important part of the work environment. Similarly, when productivity is valued over safety, employees will feel less valued, resulting in poorer safety, job satisfaction, health, and OCB. In accordance, I hypothesize that:

H5: When safety is climate is higher than productivity climate, there will be increased health, job satisfaction, and OCB, and decreased accidents and near misses.

However, as reviewed earlier in the paper, this discrepancy between climates may also create a tension between safety and productivity. When this tension is in favor of safety, workers will spend more time being safe than being productive, which should lead to decreased employee productivity. Therefore:

H6: When safety climate is higher than productivity climate, there will be decreased productivity.

Although I have hypothesized about the relationship between this discrepancy and productivity, it is possible that the relationship with quality will not follow the same pattern. If safety climate is higher than productivity climate, employees are likely to spend more time making sure that the job is done as safely as possible. In doing so, this will likely slow them down, allowing them to focus on getting the job done “right” the first time, and doing a quality job so that the work doesn’t have to be redone. This is similar to the speed/accuracy tradeoff seen in human performance research (Brewer & Ridgway, 1998; Förster, Higgins, & Bianco, 2003; Kaminski, 2001; Woodworth, 1899). Employees who follow work rules and procedures accurately (i.e. produce quality work) are more likely to perform safely, whereas those who can accomplish large amounts of work more quickly are likely to be more productive, with potentially less quality work (Wallace & Chen, 2006). It is possible that a climate for safety will also translate to a climate for quality (discussed further later), thus:

H7: When safety climate is higher than productivity climate, there will be increased quality.

The Relationship Between Productivity Climate and Quality Climate

The importance of making a good product, and making it well, cannot be understated in terms of its impact on organizational success. The idea of a HPWC is becoming increasingly important for organizational success, and the lack of such a culture could be a path to organizational mediocrity, or even bankruptcy (Wriston, 2007). Although there are many definitions as to what makes a HPWC, most include the need for a company philosophy regarding performance expectations, total quality management, and collaboration between employees and stakeholders (MacCormick & Parker, 2010; Murphy, 2008). When values for productivity and quality are in agreement, the outcome may be similar to that of a HPWC, and the optimization of the relationship between productivity and quality is dependent on the climate surrounding them (Godard, 2004). Employees that understand what their expectations are in terms of performance and quality, and are held accountable to those expectations, perform better than those that are not held to clear expectations (e.g., Aryee et al., 2012). By fully engaging the workforce, organizations can work hard, work smart, and continue to succeed. Thus:

H8: When quality and productivity climate are in agreement, they will be significantly related to organizational outcomes. More specifically, when they are in agreement, a higher level of each will be positively related to employee productivity, quality, and organizational citizenship behaviors.

A climate for quality also encourages employees to take the time necessary to do the job correctly (e.g., Brewer & Ridgway, 1998). By slowing down to do the job right the first time, employees may also take the time necessary to follow safety precautions. For many jobs, doing the job right the first time (i.e. doing quality work) could also mean getting the job done with no accidents or injuries. If employees perceive that the organization cares about getting the job done (i.e., productivity) and doing it well (i.e., quality), they may also believe that the organization care about their well-being, subsequently increasing employee health-related outcomes:

H9: When quality and productivity climate are in agreement, they will be significantly related to individual outcomes. More specifically, when they are in agreement, a higher level of each will be positively related to employee health, work ability, and job satisfaction, and significantly negatively related to accidents and near misses.

Just as the agreement between quality and productivity climate should be related to positive outcomes, the size of the discrepancy between these values could negatively impact organizational outcomes. If employees perceive a conflict between getting the work done fast and getting it done well, at least one important outcome will suffer (Huselid, 1995). Employees will likely experience more stress as they attempt to work through the tension between goals, resulting in decreased productivity and quality. A lack of clear performance expectations (i.e. when climates are at odds) influences employee health, and the more unclear the expectations are, the greater the negative impact on health (Murphy, 2008). Therefore:

H10: When quality and productivity climate are in disagreement, they will be significantly related to organizational outcomes. More specifically, a larger discrepancy between the two climates will lead to decreased employee productivity, quality, and organizational citizenship behaviors.

H11: When quality and productivity climate are in disagreement, they will be significantly related to individual outcomes. More specifically, a larger discrepancy between the two climates will lead to decreased employee health, work ability, and job satisfaction, and increased accidents and near misses.

Following from these hypotheses, it is important to consider how the direction of the discrepancy may impact the outcomes. When productivity is valued over quality, workers may be more productive, but they may also produce a lower quality product. In addition, if employees perceive that the organization doesn't value quality work, they may also perceive that the organization doesn't care about them (Landsbergis, Cahill, & Schnall, 1999). On the other hand, if doing a good job is important to the organization, so important that they are willing to sacrifice productivity, then employees may be happier, healthier, and produce a higher-quality product, albeit less of it. Therefore,

H12: When quality climate is higher than productivity climate, there will be increased quality, health, job satisfaction, safety input, and OCB, decreased accidents and near misses, and decreased productivity.

The Relationship Between Quality Climate and Safety Climate

The hypothesized relationships between safety and productivity and quality and productivity have set up a unique relationship between safety and quality. When reviewing the relationship between productivity and safety, I proposed that a climate for employee safety and well-being communicates to employees that they are respected and appreciated (Hofmann & Tetrick, 2003). Promoting a value for safety encourages workers to take the time necessary to do the job safely (Zohar, 1980). Similarly, when reviewing the relationship between quality and productivity, I proposed that a climate for quality communicates to employees that the organization cares about the product or service that it provides, and that employees should slow down to do the job correctly (Godard, 2004). Therefore, it is possible that the systematic processes and messages sent to employees are similar when comparing a climate for quality and a climate for safety (Landsbergis et al., 1999). There is some evidence to suggest that this may be possible, as the relationship between safety and quality is often positive (e.g., Gehring et al., 2013). When organizations value both quality and safety, employees that perceive this are likely to promote positive individual and organizational outcomes:

H13: When quality and safety climate are in agreement, they will be significantly related to organizational outcomes. More specifically, when they are in agreement, a higher level of each will be positively related to employee productivity, quality, and organizational citizenship behaviors.

H14: When quality and safety climate are in agreement, they will be significantly related to individual outcomes. More specifically, when they are in agreement, a higher level of each will be positively related to employee health, work ability, and job satisfaction, and significantly negatively related to accidents and near misses.

In addition, due to the close connection between quality and safety climate, I propose that the size of the discrepancy between them could be detrimental to these outcomes. However, because they are so closely linked, it should not matter whether quality climate is higher than safety climate or if safety climate is higher than quality climate. The only thing that should influence outcomes is whether they are in agreement, or if they are not, the degree of their discrepancy. Thus:

H15: When quality and safety climate are in disagreement, they will be significantly related to organizational outcomes. More specifically, a larger discrepancy between the two climates will lead to decreased employee productivity, quality, and organizational citizenship behaviors.

H16: When quality and safety climate are in disagreement, they will be significantly related to individual outcomes. More specifically, a larger discrepancy between the two climates will lead to decreased employee health, work ability, and job satisfaction, and increased accidents and near misses.

H17: The direction of the discrepancy between quality and safety climate will have no significant impact on individual or organizational outcomes.

Testing These Relationships

Traditionally, questions such as this have been tested using difference scores (Edwards, 2002). However, there are a number of limitations to this approach. First, when calculating the difference between two separate constructs in an attempt to quantify a third variable of interest, as is the case in my study (e.g., calculating the difference between a climate for safety and a climate for productivity in an attempt to quantify the discrepancy between these climates), it is unclear what exactly the difference signifies, and what its relation to the outcome variable represents (Zuckerman, Gagné, Nafshi, Knee, & Kieffer, 2002). More specifically, when taking this approach ($a – b = c$), the difference score, c, is completely predictable from the two original variables, a and b. Therefore, it is not possible to know the relationship between c and the outcome, y, while controlling for the effects of a and b. In addition to this problem, when using the difference between two variables, the reliability of the difference score is substantially lower than either of the reliabilities of the original variables themselves (Edwards, 2002).

Therefore, some researchers have suggested that the residual difference be used, in which a is regressed on b, and the difference score is calculated by subtracting the value of a as predicted by b from a. These residual difference scores are also potentially problematic, due to the dependencies formed through this process, resulting in confounded scores that don't necessarily measure what researchers intend to measure (for more in depth review, see Assor, Tzelgov, Thein, Ilardi, & Connell, 1990; Griffin, Murray, & Gonzalez, 1999; Zuckerman et al., 2002). Thus, traditional difference scores may not be the most ideal way to answer my questions.

To address this dilemma, more recent research has suggested the use of an interaction variable (a x b), to be used in a traditional regression framework, as a more appropriate way to test how the difference between two variables is related to a third (Edwards, 1994; Edwards & Parry, 1993; Zuckerman et al., 2002). In this way, I can test how both a and b are related to the outcome, and control for these in assessing how the interaction between them is related to the outcome. As an example, in order to truly understand how the relationship between productivity and quality is related to employee productivity, it is necessary to control for the effect that productivity climate and quality climate have on employee productivity, respectively. The result is a three-dimensional representation of how the two climates are independently related to the outcome variable, and how the interaction between them is also important, separate from the effects of these variables individually.

In order to do this, a polynomial regression model will be specified for each pair of climates, and the results of this model will be analyzed using response surface methodology (RSM). Polynomial regression is important for the present study because it allows me to assess how the agreement or disagreement between two climates influences the outcomes, while controlling for the main effects of these climates themselves. Beyond traditional regression, which assesses how x is related to y in a linear fashion, polynomial regression allows me to test whether the relationship between x and y is curvilinear. Testing curvilinearity in these relationships will allow me to examine in more detail how the two climate values are related to the outcomes, as described below.

Once the three-dimensional space is established through polynomial regression, response surface methodology (RSM) can be used to assess the surface of this three-dimensional plane and answer more complex questions about the relationship between these two variables and an outcome (Box & Draper, 1987). Specifically, the use of four "surface tests" allows me to answer three questions (Shanock, Baran, Gentry, Pattison, & Heggestad, 2010). First, how does the agreement between two climates relate to the outcome? Surface tests 1 and 2 will assess this relationship and its curvilinearity, respectively. In other words, when the value for safety and productivity is equal (or within half a standard deviation of each other), does productivity increase as their combined level of climate increases (i.e., H1, H2, H9, H10, H13, H14)? Second, I can test whether the degree of discrepancy between the two climates influences the outcome variables (surface test 3). More specifically, as the discrepancy between safety and productivity increases, does productivity decrease at a greater rate (i.e., H3, H4, H10, H11, H15, H16)? Last, I can test whether the direction of this discrepancy matters (surface test 4). Does it matter whether productivity is valued more than safety, or whether safety is valued over productivity (i.e. H5, H6, H7, H12, H17)? These four tests will allow me to answer my research questions regarding how the relationships between these climates are related to the outcomes.

The Importance of Leadership for These Relationships

It is important to consider the role of leadership in establishing these three climates because of the long history of research supporting the pivotal role that supervisors play in building organizational climates (e.g., Lewin, Lippitt, & White, 1939; Zohar, 2000). Although the climate of an organization most often determines how employees behave at work, and their attitudes towards certain issues (Schein, 1990), the role of the leader in developing this climate cannot be understated (Schneider & Reichers, 1983). Leaders are most often the ones writing and enforcing the policies and procedures that support each of these climates, they develop the trainings designed to inform employees about each of these climates, they show their own commitment to each of these climates, and they facilitate interactions between employees to help involve them in the assessment of each of these climates (Barling et al., 2002; Zohar, 2011). Employees look to leaders as role models for how to interpret each of these components (Zohar, 2010). In addition, leaders are a key component of developing strong climates, or climates where there is more cohesion and agreement among a work group (Luria, 2008). Climate strength is important because when employees have similar perceptions of how they are to behave at work, they work together as a team to complete work tasks more efficiently, leading to improved outcomes (Ostroff & Bowen, 2000; Schneider, Salvaggio, & Subirats, 2002; Zohar & Luria, 2005). Therefore, understanding the role of leadership in safety, quality, and productivity climates could be an important part of this framework.

Oftentimes, measures of climate include scales specifically designed to assess how leaders support the climate we are measuring, but it is important to go beyond this for several reasons. First, organizational climate is an amalgamation of procedures, policies, training, and employee involvement in addition to this management commitment aspect (e.g., Griffin & Neal, 2000a; Schneider & Reichers, 1983). In other words, the climates for safety, quality, and productivity are multifaceted. Management commitment as a component of climate is assessed through leader behaviors specifically in relation to safety, quality, and productivity. However, when assessing overall leadership, employees base their perceptions on the uniform behaviors and attitudes of their leaders across all domains (Luria, 2008). Therefore, the management commitment aspect of organizational climate is not enough to help me understand the importance of leadership as a whole in the development of these climates. This leads me to the second reason, that separating leadership from the climate measures allows me to assess how leadership itself is affecting climate perceptions. With an understanding of how leadership plays a role within this framework, it is possible to explore how organizations can develop these three climates and form relationships between them. To address this point, I will specifically assess how transformational leadership is related to safety, quality, and productivity climates.

Transformational leadership is one of the most widely researched and well-supported theories of leadership (e.g., Hiller, DeChurch, Murase, & Doty, 2011). Transformational leaders unite employees towards a common goal and encourage them to be the best versions of themselves (Bass, 1985). They earn the respect of their followers by behaving with integrity, motivating employees, promoting open-minded thinking, and caring about employees as individuals (Avolio, 1999). In doing so, transformational leaders promote many positive organizational outcomes, and there is evidence that transformational leadership is related to safety, productivity, and quality climates and outcomes individually.

A large body of research exists on the positive effects of transformational leadership on safety climate in particular (Kelloway, Mullen, & Francis, 2006a; Mullen & Kelloway, 2009; Zohar, 2002). In addition, there is some evidence for a direct relationship between leadership and health-related outcomes such as job satisfaction (Nielsen, Randall, Yarker, & Brenner, 2008), improved health and well-being (Burnette, Sinclair, Wang, & Shi, 2011; Kara, Uysal, Sirgy, & Lee, 2013; Nyberg, Westerlund, Hanson, & Theorell, 2008; van Dierendonck, Haynes, Borrill, & Stride, 2004), reduced accidents and injuries (Mullen & Kelloway, 2009), and increased learning from near misses and accidents (Ginsburg et al., 2010). Furthermore, safety climate often directly or indirectly mediates the relationship between leadership and safety outcomes (Barling et al., 2002; Christian et al., 2009b; Clarke, 2013; Kelloway et al., 2006b; Nahrgang et al., 2011; Wu, Chen, & Li, 2008). Therefore, I hypothesize that:

H18: Safety climate will directly mediate the relationship between transformational leadership and well-being outcomes.

Transformational leadership is also an important predictor of employee productivity and overall job performance (Bass, Avolio, Jung, & Berson, 2003; Judge & Bono, 2000; Judge & Piccolo, 2004; Keller, 2006; Whittington, Goodwin, & Murray, 2004) Specifically, transformational leaders promote employee task performance and organizational citizenship behaviors (Carter, Armenakis, Feild, & Mossholder, 2013). Recent research supports a number of mediators in the transformational leadership to employee productivity relationship, such as support for innovation (Howell & Avolio, 1993), team potency and cohesion (Bass et al., 2003) and supervisor-subordinate relationship quality (Carter et al., 2013). However, there is surprisingly little on how specific climates may mediate this relationship. Climates for goal clarity and creative thinking (Nemanich & Keller, 2007), and positive affect and trust (Menges, Walter, Vogel, & Bruch, 2011) have been shown as mediators in the relationship between transformational leadership and employee productivity and OCB. In a more complicated path model supported by Kovjanic et al. (2013), transformational leaders fulfilled needs for competence and relatedness, which predicted work engagement, which subsequently predicted productivity. These studies do not directly assess productivity climate, but I may extrapolate from this evidence that certain climates may mediate the relationship between transformational leadership and employee outcomes. Therefore:

H19: Productivity climate will directly mediate the relationship between transformational leadership and productivity outcomes.

In addition to safety and productivity, there is evidence that employees with transformational leaders tend to have higher quality work (Herrmann & Felfe, 2012; Hiscock & Shuldham, 2008; Jabnoun & Rasasi, 2005; Squires, Tourangeau, Spence Laschinger, & Doran, 2010). Again, there is a limited amount of research on the mediators of this particular relationship. In a study by Nembhard and Edmondson (2006), psychological safety mediated the relationship between leadership and quality. In the same study reported above from Kovjanic et al. (2013), transformational leadership had a direct effect on quality of work, and also predicted quality through the path described above. Similar to productivity climate, this research does not explicitly explore how quality climate could impact the relationship between leadership and quality. However, we believe that this evidence combined with past work supporting the ability of organizational climates to mediate the relationship between transformational leadership and outcomes (e.g., Barling et al., 2002), is enough to propose that:

H20: Quality climate will directly mediate the relationship between transformational leadership and quality outcomes.

The Present Study

Successful organizations have leaders that promote positive climates for safety, productivity, and quality simultaneously (e.g., MacCormick & Parker, 2010). Current research on successful organizations uses these climates (as well as others) to predict important outcomes.

However, this research typically studies each of these climates and their relative outcomes in isolation, and we have yet to understand how these climates interact to influence these outcomes (Akin & Hopelain, 1986; Clarke, 2013; Harvey & Stensaker, 2007). In the present study, I evaluate how the agreement and disagreement between safety, productivity, and quality climates is related to individual and organizational outcomes. In addition, I assess how transformational leadership plays a role in these relationships, and test whether each of these climates mediates the relationship between leadership and the outcomes.

METHODS

Participants

A construction organization agreed to take part in this research, and identified 5 jobsites to be surveyed. Of the 356 employees recruited, 216 responded, resulting in an overall response rate of 60.4%. The participants varied in age; 14.2% were between the ages of 18 and 25, 32.4% were between 26 and 35, 27.9% were between 36 and 45, 22.1% were between 46 and 55, and 3.4% were between 56 and 65. Tenure ranged from 1 month to 22.8 years, with an average of 3.8 years (SD=4.62 years). Time with supervisor ranged from 1 month to 20 years, with an average of 1.1 years (SD=2.13 years). Of this sample, 23.7% were apprentices, 39.2% were journeymen, 11.2% were foremen or general foreman, 5.2% were superintendents, 6% were project managers, 5.1% were project engineers, and 5.1% were administrative personnel. There were a variety of trades represented in the sample as well; 26% were plumbers, 18.1% were pipefitters, 25.1% were sheet metal workers, 2.3% were electricians, and 10.2% were skilled in multiple trades.

Measures

Demographics. Participants were asked a number of demographic and background questions. These included age group (18-25 years, 26-35 years, 36-45 years, 56-65 years, 65+years), time with company, time with supervisor, jobsite, trade, and level within the company. Gender and ethnicity were not included in this study due to confidentiality concerns on behalf of the organization. Collecting gender and ethnicity data would have made it easier to identify the individuals that did not fall into majority categories. The variables of jobsite, trade, and level within the company were collected so that we could aggregate data to the work-group level, and relate it to outcomes at the work-group level. Work groups ranged from 1 – 21 employees each (M=5.69, SD=5.46), and the questions of gender and ethnicity would have been particularly identifying when the work-group level had already been identified.

Climate scales. In order to test my research questions related to the agreement and disagreement between safety, productivity, and quality climate, I used response surface methodology (described in the analysis section below). This method of analysis requires that the measures being compared are essentially parallel to allow for the most logical comparison between them. Therefore, the measures of safety, productivity, and quality climate needed to meet this assumption. Although there are many established measures of safety climate in the literature, the research on productivity and quality climates in particular is scarce. Therefore, I used an established measure of safety climate (Neal, Griffin, & Hart, 2000) as a model for building parallel measures of productivity and quality climates.

I chose this measure of safety climate for a few reasons. First, it is well-validated and has been used in numerous studies of safety climate in a variety of industries (Brondino, Silva, & Pasini, 2012; Cigularov, Lancaster, Chen, Gittleman, & Haile, 2013; Colley, Lincolne, & Neal, 2013; Tholén, Pousette, & Törner, 2013). Second, it consists of four factors that I believe translate well to productivity and quality climates. The scale uses three items to measure management values (e.g., “My supervisor considers safety to be important.”), three items to measure communication (e.g., “there is open communication about health and safety issues within this workplace”), two items to measure training (e.g., “employees receive comprehensive training in workplace health and safety issues”), and two items to measure safety systems (e.g., “the health and safety procedures and practices in this organization are useful and effective”).

Before adapting the safety climate measure to productivity and quality, it was necessary to gain an understanding of what productivity, quality, and safety meant to individuals within the company. Fortunately, the company had already developed definitions for each of these terms that had been tested and validated with the majority of the company, and thus the company definitions were recognizable and understood for each of these terms. Next, each of the 10 safety climate items was adapted to assess a value for productivity and quality (respectively). As an example, the management commitment item provided as an example above was changed to "My supervisor considers productivity to be important" for productivity climate, and "My supervisor considers quality to be important" for quality climate.

Following item adaptation, 10 individuals from varying areas and levels of the company were asked to rate each item on a scale of 1 (*not at all relevant*) to 3 (*completely relevant*) regarding how well each item represented the provided definitions of productivity and quality. This was done to ensure that the adapted items were construct valid and made sense to participants. In addition, participants were asked to rate each item on its clarity on a scale of 1 (*not at all clear*) to 3 (*very clear*). Scores were averaged across the group and items with a score of 2.6 or higher were retained for use in the scale. If items did not reach this benchmark, the focus group was probed on how to rewrite the item such that it was content valid and made sense for all of the climate scales to maintain parallelism.

Within the productivity scale, 8 of the 10 items had an average "relevance score" above 2.6, and 9 of 10 items had an average "clarity score" above 2.6. The items that did not reach acceptable levels were discussed and modified to become clearer and more relevant. For the quality scale, all 10 items had an average relevance score above 2.6, and 8 of 10 items had an average clarity score above 2.6. Again, these items were modified as necessary for the proper meaning to come across. For all of the items modified, items were changed across the three scales to maintain parallelism. However, it is important to note that the changes made to each item were very minimal (e.g. changing “management” to “my supervisor”).

Within each of these scales, I wanted to include a check for individuals who may have been acquiescing (i.e., rating everything as high) or not thoroughly reading the questions, so two items were reverse-coded. In this way, I could identify individuals who failed to differentiate their responses among all of the items, and flag their data for potential exclusion (Krosnick, 1991; Tourangeau & Rasinski, 1988). Together, this resulted in three scales with 10 items each to measure safety, productivity, and quality climates. A full list of these items, as well as the other items on the survey, is provided in the Appendix. On the company survey, participants were provided with the definition of each construct and the adapted climate items, and asked to indicate on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*) how much they agreed with each statement.

Leadership. The Global Transformational Leadership scale (GTL; Carless, Wearing, & Mann, 2000) was used to assess transformational leadership (α = .96). For the purposes of my study, the use of a general measure was more appropriate than a multifaceted measure such as the Multifactor Leadership Questionnaire (Bass & Avolio, 1990) or the Transformational Leadership Inventory (Podsakoff, MacKenzie, Moorman, & Fetter, 1990). Multifaceted measures of transformational leadership have often been criticized for having high factor and item intercorrelations such that interpretation of how different facets contribute to outcomes is questionable (Barling, Christie, & Hoption, 2010; Heinitz, Liepmann, & Felfe, 2005). As the purpose of the present study was to assess how leadership in general was related to the climates and outcomes, the GTL was most appropriate.

Research has supported use of the GTL as a valid measure for assessing effective leadership in a variety of populations (e.g., Arnold, Turner, Barling, Kelloway, & McKee, 2007; Kelloway, Weigand, McKee, & Das, 2012; Mullen & Kelloway, 2009; Nielsen, 2013; Tucker, Turner, Barling, & McEvoy, 2010), and has shown convergent validity with some of the more popular measures of transformational leadership (Carless et al., 2000). In addition, the short length of this scale (seven items) makes it particularly suitable for situations in which there are practical constraints on the length of the survey, as was the case in my study. Each item measured one of the following domains: vision, staff development, supportive leadership, empowerment, innovative thinking, lead by example, and charisma. Participants were asked to rate how often their current, immediate supervisor engaged in the given behavior on a 5-point scale ranging from 1 (*rarely or never*) to 5 (*very frequently, if not always*).

Organizational outcomes. Metrics of productivity and quality were provided by the organization, as procedures were already in place for collecting this data. The organization provided me with productivity data at the work group-level for the month following the survey distribution, and therefore this data was forward-looking. Although the specific details of this metric cannot be disclosed to protect confidentiality, this metric utilizes a variety of sources to obtain a single estimate of productivity. This value is calculated in relation to productivity goals particular to each group, but can also be compared across groups. A group that is highly productive in relation to their goals will have a positive value for productivity, whereas a group that is not meeting their productivity goals will have a negative productivity score. Productivity values ranged from -2,000 to 2,000, and thus the results for this particular outcome will look different than results for the other outcomes (i.e., unstandardized beta weights and standard errors will be higher). The organization also provided a quality score for each work-group for the month following survey distribution. This score is calculated based on a work group's ability to meet specific quality goals, such as keeping the amount of work that has to be redone to a minimum. The maximum quality score is 100, with 100 representing a group that meets all of their quality goals.

Although I had access to work-group level outcome data, it was possible that this data would not work as intended for multiple reasons. For the productivity outcome, data may have been missing due to data collection issues. For the quality outcome, data may have been missing for the same reason but also because this may have been a low base-rate phenomenon; it may have been unlikely for certain work groups to have quality problems. Therefore, to increase my chances of collecting useful and informative outcomes, I included questions on individual surveys to obtain self-reports of these outcomes. Participants were asked to indicate how often in the past week they had met or exceeded their productivity and quality goals (four separate questions). Individuals responded on a frequency scale of 0 to 5 or more times. Last, organizational citizenship behaviors were measured using the Organizational Citizenship Behavior Checklist (OCB-C; Fox, Spector, Goh, Bruursema, & Kessler, 2012). This measure is unidimensional and originally included 20 items used to indicate how frequently individuals engaged in particular behaviors. This scale was reduced to 14 items (α = .91) after removing particular behaviors (identified by the organization) that were inappropriate for this industry, such as "working through lunch," as doing so would be illegal. Participants were asked how often they had engaged in each of the behaviors (e.g., "helped co-worker learn new skills or shared job knowledge") on their present job on a scale of 1 (*never*) to 5 (*every day*).

Individual outcomes. The organization provided me with a metric for safety that they utilized as an indicator of overall safety within work groups. This metric is also out of 100 and is calculated based on a work group's ability to meet specific safety goals. These goals vary by work group, and may include avoiding injuries and near misses, but also may include more pro-active safety behaviors such as speaking up when something is wrong. Although goals differ by work group, the score is based on each group's progress towards their goals, and these scores can be compared across work groups. This data was provided for the month following survey distribution.

On the survey, employees were asked to self-report how often they had experienced a work-related accident or near miss (two separate questions) in the past week and respond on a scale of 0 to 5 or more times. They were also given a single item to measure general health – "would you say that in general your health is…" and asked to respond on a scale of 1 (*poor*) to 5 (*excellent*) (Ware, Kosinski, & Gandek, 1993). This single item has been validated as an effective means of understanding the overall health of an individual in a variety of contexts (e.g., Andrews & McKennell, 1980; Idler & Benjamini, 1997; Kaplan & Camacho, 1983). Individuals possess insights into their own health that extend beyond multi-item scales of health, and one-item scales consistently explain additional variance in mortality over other risk factors and general health information (Idler & Angel, 1990; Idler & Kasl, 1991; Idler, Russell, & Davis, 1992; McDowell & Newell, 2006).

Also included on the survey was a 4-item measure of perceived work ability (Fisher et al., under review, $\alpha = .87$). Participants were asked to think about work on their main job, and assume that work ability at its best had a value of 10 points. They then rated how many points they would give their current ability to work, and meet physical, mental, and interpersonal demands. A single-item measure of work-life balance was used in the survey to assess employees' overall perception of the balance that exists between their work and life (Fisher, 2001). They were asked to respond to the statement "Overall, I have a balance between my work and personal life” on a scale of 1 (*highly disagree*) to 5 (*highly agree*). Last, a single item measure of job satisfaction was included which asked, “How satisfied are you with your job in general?” and participants responded on a scale of 1 (*highly dissatisfied*) to 5 (*highly satisfied*). Although single item measures are not typically used in psychological research, the use of this one job satisfaction item has shown convergent validity with longer measures of job satisfaction (Nagy, 2002; Scarpello & Campbell, 1983; Wanous, Reichers, & Hudy, 1997).

Procedures

Researchers and company representatives travelled to each job site and provided surveys to the project and operations managers for the five jobsites recruited to take part in this study. Individuals were provided with a cover letter, the survey, and a sealable envelope. Surveys were distributed by the project and operations managers, and employees were given a day to complete the survey. After completing the survey, individuals placed their survey in the envelope, sealed it, and returned it to the individual that distributed the surveys.

RESULTS

Due to the fact that a few items in each climate scale were reverse coded, we examined responses to flag individuals that had zero variance in their responses to these scales. These individuals had their answers removed for that particular scale, as well as for the other climate scales if they answered similarly. This resulted in 9 individuals having their responses deleted from one scale and 3 individuals having their responses deleted from two scales, leaving a final usable sample of 204 employees.

Descriptive Statistics

Means, standard deviations, correlations, and reliabilities for all variables are reported in Table 1. In this organization, safety climate was rated the highest (M=4.39, SD=.55), followed by quality climate (M=4.01, SD=.74), and finally productivity climate (M=3.89, SD=.69). All three climate variables were significantly positively related to one another as well as leadership and a variety of outcome variables. A number of demographic variables were significantly related to the outcome variables. Older individuals reported poorer health, worse job satisfaction, and a more negative productivity climate. Those that had been with the company longer reported poorer health, were less likely to self-report meeting productivity and quality goals, had poorer work ability, perceived worse leadership, had lower quality climate and productivity climate scores, and engaged in more OCB. Individuals who had been with their supervisor for a longer amount of time engaged in more OCB.

Interrater Reliability and Agreement

To test whether aggregation of the climate scales was justified, $r_{wg(j)}$, ICC(1), and ICC(2) values were calculated. $R_{wg(j)}$ is a measure of interrater reliability that assesses the relative consistency in scores on multi-item measures provided by multiple individuals (James, Demaree, & Wolf, 1984; LeBreton & Senter, 2007). Another means of assessing climate perceptions is through intraclass correlations (ICC) (LeBreton & Senter, 2007, pg. 822). ICC(1) values represent the proportion of variance in a variable that is due to between group differences, while ICC(2) values represent the reliability of the mean rating assigned by a group of individuals (Shrout & Fleiss, 1979).

Starting with safety climate, 26 work groups were analyzed ranging from 2 to 20 individuals each. The average $r_{wg(j)}$ value for safety climate was .95, with a range of .90 to .99. The ICC (1) value for safety climate was -.02, and the ICC (2) value for safety climate was -.24. As suggested by Taylor (2010), negative ICCs are possible within the range of values, and should be interpreted as low values where two individuals from the same group vary as much as two individuals randomly chosen from the entire organization. The productivity climate statistics were calculated on 26 work groups (2 to 19 individuals), and the average $r_{wg(j)}$ value was .93 (range of .77 to .99). The ICC (1) value for productivity climate was .01, suggesting that 1% of the variance in individual productivity climate scores can be attributed to between-work groups differences. The ICC (2) value for productivity climate was .08, meaning that although there is some between-group variability, I cannot reliably identify the group an individual belongs to based on his or her productivity climate score. Last, the quality climate statistics were calculated on 26 groups (2 to 17 individuals), and the average $r_{wg(j)}$ value was .93 (.73 to 1.00). The ICC (1) value for quality climate was -.04, and the ICC (2) value was .22. Together, these statistics suggest that the climate variables are best kept at the individual level, and any between-group effects observed should be interpreted with caution.

Factor Analyses

I used confirmatory factor analysis to test a 1-factor model for each of the climate scales (Table 2). Results revealed that the reverse coded items, as well as one additional item, did not perform well within each of the climate frameworks. An examination of the data revealed that although individuals who had no variation in their responses had been removed, there were still individuals that failed to differentiate the reverse coded items from the other items in the scale. As an example, they may have been varying between responding with 4s and 5s on the survey (agree and strongly agree), suggesting that they thought this was overall a positive climate. However, when a question arose that was reverse coded and should have provoked a response such as disagree or strongly disagree, they continued their same pattern of responding and marked agree or strongly agree.

These individuals were flagged and compared to the remainder of the sample for any significant differences. These individuals made up a large portion of the sample; 29% of the sample was flagged for this response pattern on one of the climate scales, 11% was flagged for this pattern on two scales, and 4% was flagged for this pattern on all three climate scales (resulting in a total of 44% of the sample being flagged). Although the flagged individuals were demographically comparable to the remainder of the sample, individuals who failed to differentiate their responses on the reverse coded items were more likely to report having an accident or a near miss in the past month, had poorer work ability, and poorer perceptions of leadership. The key differences between these groups suggested that removing their responses could result in a bias to the results.

Upon further inspection of the reverse coded items, I determined that by reverse coding them, the meaning of the items had changed in a way that was no longer consistent with the meaning of the scale. For example, the original item “there is enough time to discuss and deal with safety issues” was changed to “there is NOT enough time to discuss and deal with safety issues.” By answering “disagree” on the original question, individuals are stating that there is not enough time. However, by answering “disagree” to the reversed item, individuals could be suggesting that there is more than enough time to deal with safety issues (potentially too much time), or simply that there is sufficient time to deal with these issues. The double-barreled nature of this question, as well as the inability to distinguish the meaning that participants were conveying with their answers, suggested that this item should be deleted. This item also had low factor loadings and almost no variation across the climate scales, empirically supporting the decision to remove it. A similar screening process was conducted with the other reverse coded item, and it was also flagged for removal. One additional item had poor performance across all three climate scales. This item was: “employees are regularly consulted about workplace safety issues.” This item had a relatively high standard deviation (almost 1), and the high variation among respondents could have contributed to the low factor loadings across all three climate scales (ranging from .38 to .63) relative to the other items. Therefore, this item was also flagged for removal.

Comparing the factor structures for the climate scales across the flagged sample and the remaining individuals revealed that these items performed poorly across both samples. Although acquiescence bias may have occurred amongst a portion of the sample, these three items were simply not performing well. Therefore, I decided to remove these three items from the scales, and keep the flagged individuals in the sample. However, individuals identified as having zero variance in their responses were still removed from the sample.

A confirmatory factor analysis was again conducted on these reduced measures; however, a 1-factor model still did not fit well. Based on the original scale, a four-factor model was specified. Factor correlations for this model were very high, resulting in a non-positive definite covariance matrix. Therefore, a 2-factor model was specified for each of the climate scales, combining management and employee involvement into one factor (labeled management and employee involvement), and training and safety systems into another (labeled formal systems). A two-factor model fit significantly better than a one-factor model for all three climate scales, with safety and quality climate factor structures showing good fit, and the productivity climate factor structure showing acceptable fit (Table 2). Therefore, this two-factor model was used in subsequent analyses.

Although I will only test individual-level effects in relation to my research questions, it is prudent to model my data the way they are structured. That is to say, although I will not interpret between-group differences, I will conduct the remainder of my analyses while taking into account the dependencies within work groups. However, testing such a model would require a considerable amount of power, and because of the small sample size, it was necessary to make a decision regarding the best way to manage the structure of the data. In order to conserve power, I decided to test each factor (i.e., management and employee involvement and formal systems) separately in relation to the variables, using averaged factor scores rather than individual indicators loading on latent constructs. In previous studies utilizing response surface methodology (Edwards, 1994, 2002; Shanock et al., 2010; Woo, Sims, Rupp, & Gibbons, 2008), researchers have used averaged factor scores rather than latent variables in an SEM framework, which seems similarly appropriate in this case. Separating these two factors allowed me to focus on the distinctions between each of them as they related to the outcome variables.

Relationships between Individual Climates and Outcome Variables

I utilized simple linear regression to test my hypotheses in a preliminary fashion. Due to the significant correlations between some of the outcome variables and demographic variables (as mentioned above), age and tenure were included as covariates in the appropriate models to control for these effects. All climate variables were centered at the mean (3.0) for easier interpretation. In addition, standard errors were adjusted to reflect shared variance within groups using the sandwich estimator with a complex model in MPlus (White, 1980). Individuals who perceived there to be more management and employee involvement in safety had higher job satisfaction and were more likely to self-report meeting quality goals (Table 3). Improved perceptions of formal systems for safety were positively related to job satisfaction, work ability, and self-reported meeting quality goals (Table 3). Higher perceptions of management and employee involvement in productivity were only related to higher perceptions of work ability, whereas increased perceptions of formal systems for productivity were related to increased health, job satisfaction, work life balance, work ability, OCB, and self-reported exceeding quality goals (Table 4). Individuals with higher perceptions of management and employee involvement in quality had increased health, job satisfaction, work life balance, work ability, OCB, and self-reported meeting quality goals (Table 5). Last, higher perceptions of formal systems for quality were related to increased health, job satisfaction, work life balance, work ability, OCB, self-reported meeting productivity goals, and self-reported meeting and exceeding quality goals (Table 5).

Polynomial Regression and Response Surface Methodology

Next, I used polynomial regression to assess the relationships between pairs of climates and the outcomes. The significant demographic variables from the linear regression models above (age and tenure) were retained in the polynomial regression models as covariates, and, as above, standard errors were adjusted using the sandwich estimator to reflect shared variance within groups (White, 1980). The results of these polynomial regression models were then assessed using response surface methodology (RSM; Box & Draper, 1987). A summary of results is presented in Tables 6 and 7.

Safety and productivity climates. First, climates for safety and productivity were assessed (Tables 8 – 13). For management and employee involvement, the overall model R^2 value was non-significant for every variable except self-reported meeting quality goals, injuries, and OCB, and therefore these models are not interpreted (Shanock et al., 2010). However, for the models in which the overall model R^2 value was significant, only one surface test was significant; the curvilinear test of the line of disagreement for injuries (partially supporting Hypothesis 4 and providing no support for Hypotheses 1, 2, 3, 5, 6, and 7). A greater discrepancy between perceptions of management and employee involvement in safety and productivity was associated with increased injuries. The RSM graph for this relationship is presented in Figure 1.

The overall model R^2 value for the model comparing formal systems for safety and productivity climate was only significant for work-life balance, OCB, and self-reported meeting quality goals. The slope along the line of agreement was significant for work-life balance and OCB (partially supporting Hypothesis 2 and providing no support for Hypothesis 1). When formal systems for safety and productivity are in agreement, a higher level of each leads to greater work-life balance and OCB. Furthermore, a greater discrepancy between the formal systems for safety and those for productivity is associated with decreased work-life balance (partially supporting Hypothesis 4, and providing no support for Hypothesis 3). Last, when formal systems for safety climate are perceived more positively than formal systems for productivity climate, OCB decrease (partially supporting Hypothesis 5 and providing no support for Hypotheses 6 and 7). The RSM graphs for these relationships are presented in Figures 2 and 3.

Quality and productivity climates. Next, climates for quality and productivity were assessed (Tables 14 – 19). For management and employee involvement, the overall model R^2 value was significant for health, self-reported meeting productivity goals, and near misses. Neither the slope nor the curvature along the line of agreement was significant for any of these models (providing no support for Hypotheses 8 or 9); however, the curvature along the line of disagreement was significant for self-reported meeting productivity goals, and the slope along the line of disagreement was significant for health and near misses (partially supporting Hypotheses 10 and 12, and providing no support for Hypothesis 11). A greater discrepancy between perceptions of management and employee involvement in productivity and quality was associated with increased reports of meeting productivity goals. Furthermore, when management and employees are more involved in quality than productivity, health is increased; when they are more involved in productivity than quality, near misses decrease. The RSM graphs for these relationships are presented in Figures 4 – 6.

The overall R^2 value for the model comparing formal systems for productivity and quality climate was significant for many more models, and more of the surface tests were also significant. The slope along the line of agreement was significant for job satisfaction, work-life balance, self-reported meeting productivity goals, self-reported meeting and exceeding quality goals, organization-reported quality and safety scores, and work ability (partially supporting Hypothesis 8 and 9). When formal systems for productivity and quality are in agreement, a higher level of each leads to an increase in all of these outcomes. A greater discrepancy between the formal systems for productivity and those for quality is associated with decreased self-reported meeting productivity goals and organization-reported quality and safety scores (partially supporting Hypotheses 10 and 11). When formal systems for quality climate are perceived more positively than formal systems for productivity climate, there is a decrease in self-reported meeting productivity and exceeding quality goals, decreased organization-reported safety and quality scores, and decreased work ability (partially supporting Hypothesis 12). The RSM graphs for these models are presented in Figures 7 – 13.

Quality and safety climates. Last, I examined quality and safety climates (Tables 20 – 25). The overall R^2 value for the models comparing management and employee involvement in safety and quality was only significant for health, work-life balance, self-reported meeting quality goals, near misses, and OCB; therefore, surface tests are only interpreted for these models. The slope along the line of agreement was significant for work-life balance and OCB (partially supporting Hypothesis 14 and providing no support for Hypothesis 13). When management and employee involvement in safety and quality are in agreement, a higher level of each leads to greater work-life balance and increased OCB. The curvature of the line of disagreement was significant for health (partially supporting Hypothesis 16, and providing no support for Hypothesis 15), and the slope of the line of disagreement was significant for self-reported meeting quality goals and near misses (not supporting Hypothesis 17). This suggests that as the discrepancy between management and employee involvement in safety and quality increases, employees are increasingly less healthy. When management and employees are more involved in safety than in quality, employees are less likely to report meeting quality goals and experience less near misses. The RSM graphs for these models are presented in Figures 14 – 18.

Comparing formal systems for safety and quality, the overall model R^2 value was significant for satisfaction, work-life balance, self-reported exceeding productivity goals and meeting quality goals, self-reported injuries, OCB, and organization-reported safety score. The slope along the line of agreement was significant only for work-life balance, partially supporting Hypothesis 14, and providing no support for Hypothesis 13. As the formal systems for safety and quality are in agreement at a higher level, employees experience more work-life balance. The curvature along the line of disagreement was significant for self-reported exceeding productivity goals, injuries, and OCB (partially supporting Hypotheses 15 and 16), and the slope of this line was significant for self-reported exceeding productivity goals and injuries (partially supporting Hypothesis 17). A greater discrepancy between formal systems for safety and quality is associated with a greater decrease in self-reported exceeding productivity goals, increased injuries, and decreased OCB. When formal systems for quality are stronger than they are for safety, employees are less likely to report exceeding productivity goals and experience fewer injuries. The RSM graphs for these models are presented in Figures 19 – 23.

Leadership

I started the analysis of leadership by assessing the factor structure of leadership. A one-factor model fit the data well ($\chi^2 = 32.45$, $df = 1$, $p < .01$, CFI = .99, RMSEA = .08.). Thus, a single averaged factor score was used to represent leadership in the remainder of the models. Next, I assessed interrater reliability and agreement among work groups. Statistics were calculated on 26 work groups (ranging from 2 – 21 individuals), with an average $r_{wg(j)}$ value of .90 (.00 to 1.00). The ICC (1) value for leadership was .07, and the ICC (2) value was .34. Even though there is some shared variance among work groups, I cannot reliably distinguish which individual belongs to which work group, and thus only individual-level effects will be interpreted. Furthermore, the structure of this organization allowed for specific work groups to be identified; however, individuals within a single work group may have worked for different supervisors. Thus, it is more appropriate to refer to leadership at the individual level rather than at the group level.

Simple linear regression models were specified for leadership and the outcomes (adjusting the standard errors using the sandwich estimator to reflect shared variance within groups; White, 1980), as presented in Table 26. Leadership was significantly positively related to all of the climate variables except for management and employee involvement in productivity climate and formal systems for quality climate. Leadership was also significantly positively related to job satisfaction, work life balance, self-reported meeting productivity goals, and work ability. I used multilevel structural equation modeling to test the final hypotheses. Although the cross-sectional nature of my data does not allow me to make conclusions about causal order, I can use SEM to test whether my data is consistent with the pattern implied by a mediational model. Average factor scores for management and employee involvement and formal systems for safety, productivity, and quality climates were included to assess their roles as mediators in the relationship between leadership and the outcomes. Based on the results of the simple linear regression models, mediation models were only specified for those models where climate and leadership were significant predictors of the outcome (Baron & Kenny, 1986).

I utilized the suggested path model for a 1-1-1 model with fixed slopes from Preacher, Zypher, and Zhang (2010) to specify the SEM models presented here. By running these models in an SEM framework, I am able to account for the between-level variation that exists between work groups and overcome the conflation and bias to the indirect effect that may occur with basic multilevel modeling (Preacher et al.). Furthermore, modeling the data in an SEM framework allows me to test for random intercepts. Although it is possible to test the data for random slopes, the inclusion of this would unnecessarily take away from the power to detect the effects I am interested in, especially considering that there is no theoretical basis for assuming that random slopes would exist. It is more logical, based on previous research, to assume that the relationship between these variables is the same across groups, but that the intercepts vary across groups.

As the measurement model has already been tested and confirmed in previous analyses, and to conserve power, only the path models will be assessed in this step. Therefore, although the independent and dependent variables may change across the succeeding models, all were tested using the same general framework. When testing the indirect effects, the sampling distribution around this effect may not be normal due to my small sample size (Zhang, Zyphur, & Preacher, 2009). Therefore, a bootstrap confidence interval was developed around each of the significant indirect effects for the models. Thus, when indirect statistics are marked as significant (or not), this accounts for the 95% confidence interval surrounding that estimate.

Hypothesis 18 was to test the role of safety climate as a mediator in the relationship between leadership and well-being outcomes. The results of these models are presented in Tables 27 – 28. For both management and employee involvement and formal systems, safety climate did not directly or indirectly mediate the relationship between leadership and satisfaction. Thus, Hypothesis 18 was not supported. Hypothesis 19 assessed the role of productivity as a mediator in the leadership to productivity outcome relationship. Management and employee involvement in productivity did not indirectly or directly mediate the relationship between leadership and the outcomes. However, formal systems for productivity did show a pattern consistent with indirect mediation in the relationship between leadership and job satisfaction and leadership and work ability. The results of these models are presented in Tables 29 – 31. However, as job satisfaction is not a productivity outcome, Hypothesis 19 was not supported. Last, Hypothesis 20 covered the role of quality climate as a mediator. Management and employee involvement in quality indirectly showed a pattern consistent with mediation in the relationship between leadership and work-life balance. Formal systems for quality did not indirectly or directly mediate the relationship between leadership and any of the outcomes (providing no support for Hypothesis 20). The results of these models are presented in Tables 32 – 35.

DISCUSSION

The results of this study suggest that safety, productivity, and quality climate are all important to consider in my examination of important individual and organizational outcomes. The most common outcomes that were influenced by all three climates were employee health, job satisfaction, work-life balance, work ability, OCB, and self-reported meeting and exceeding quality goals. Interestingly, formal systems for each of these climates tended to be better predictors of these outcomes than management and employee involvement, and quality climate had the most impact on a variety of outcomes. All three climates were related to a variety of outcomes, not just the outcomes to which they were theoretically related. For example, quality climate was related to more than just quality outcomes; it was also related to well-being and productivity outcomes. Current research tends to study each of these climates and their respective outcomes in isolation (Cappelli & Neumark, 1999), and the results of this study support the notion that organizations can and do utilize a variety of means to impact these varying outcomes (MacCormick & Parker, 2010). Even if these climates are studied individually, expanding the repertoire of outcomes that we include in our research may help us understand how these goals are interrelated.

Studying these climates in relation to one another provided additional information over studying them in isolation. For those outcomes that were significantly predicted by the climates, it was the alignment between formal systems for climates, and a higher level of each, that tended to have the most impact. The relationship between productivity and quality climate was related to the most outcomes, which adds to our knowledge on basic human performance research on the tradeoff between speed and accuracy (Brewer & Ridgway, 1998; Förster et al., 2003; Woodworth, 1899). When productivity and quality climate were in agreement at a high level, employees reported improved scores on some of the well-being outcomes as well as some of the performance outcomes. Although this relationship wasn't significant for all outcomes, the pattern suggests that an alignment between productivity and quality, and a higher level of each, may affect a range of outcomes. A larger discrepancy between productivity and quality climates resulted in quality and safety scores that weren't as high, but increased productivity scores. This could be due to the finding that when they were misaligned and productivity climate was higher than quality climate, employees focused on productivity, thus sacrificing both safety and quality.

The relationship between safety and quality climate showed a relatively similar pattern, which supports previous research on the importance of both goals (Gehring et al., 2013; Godard, 2004). When safety and quality climates were in agreement and at a high level, some of the employee well-being outcomes improved. However, when these climates were misaligned, a greater discrepancy between them led to a decrease in some of the productivity and well-being outcomes. The relationship between safety and productivity climate wasn't as influential in predicting the outcomes, which is interesting considering the evidence (albeit limited) suggesting that the two are interrelated (Wallace & Chen, 2006). Agreement and a high level of safety and productivity climate led to improved scores on a few of the well-being outcomes, and a greater discrepancy between the two climates led to a decrease in some of the well-being outcomes. One interesting finding here was that when formal systems for safety climate were rated higher than those for productivity climate, workers engaged in fewer OCB. These results indicate that the relationships between these climates may be just as theoretically and practically useful to understand as the relationships between these climates and outcomes in isolation. Employees appear to sense differences in these climates, and their behavior is changed according to how they perceive this alignment or misalignment. Thus, we should seek to understand to what degree these differences influence individual and organizational outcomes.

Leadership by itself was significantly related to productivity, safety, and quality climates, as well as job satisfaction, work-life balance, work ability, and self-reported meeting productivity goals, supporting previous research in these areas (Herrmann & Felfe, 2012; Judge & Piccolo, 2004; Nielsen et al., 2008). Safety and quality climates were not significant mediators in the relationship between leadership and any of the outcomes. This is particularly interesting because of past research on the role of safety climate as a mediator in the leadership to health outcome relationships (Barling et al., 2002; Clarke, 2013). However, formal systems for productivity climate did indirectly mediate the relationship between leadership and job satisfaction. Although I failed to support any of our mediation hypotheses, it is possible that my lack of power contributed to my inability to detect these effects (discussed below).

Factor analyses suggested that the climate variables be divided into a management and employee involvement piece and a formal systems piece. Although past research on climates shows a variety of factor structures (Akin & Hopelain, 1986; Harvey & Stensaker, 2007; Zohar, 1980), one of the most common elements among these structures is a leadership and communication or employee participation piece. Not all measures of climate include a formal systems dimension that addresses the training, policies, and procedures in place to support each climate. The results of this study suggest that not only did formal systems within each climate predict different outcomes than management and employee involvement in these climates, but also that these formal systems tended to predict more and a wider variety of outcomes. This suggests that climates for safety, productivity, and quality should address more than just the importance of leaders and employees by also considering the impact of these formal systems.

The present study goes beyond previous research by assessing safety, productivity, and quality climates parallel to one another and relating them to each other as well as to important outcomes. In addition, this research adds to the conceptual space surrounding the critical role of leaders in influencing climates and safety, productivity, and quality outcomes (e.g., Aryee et al., 2012; Clarke, 2013; Harvey & Stensaker, 2007). Thus, the current research adds to each respective climate literature by including outcomes that may not be traditionally included in these research areas, and by investigating each individual climate's relationship to other important organizational climates. These elements play major roles in many organizations, and by studying their interactions, the results of this study provide a more realistic picture of how varying organizational objectives collide to predict a diverse range of individual and organizational outcomes.

These findings are important for both science and practice. Rather than creating silos for these key organizational goals, academics and practitioners should take a more holistic perspective. An understanding of the interaction between safety, productivity, and quality climate, and the role that leadership plays in building these climates, can maximize the outcomes that we wish to see. As an example for practice, consider an organization that would like to increase the productivity of its employees. Moving beyond physical efficiency into psychological motivation, a consultant may choose to focus on establishing rewards for high productivity or create an environment that supports high productivity (which may increase productivity culture). However, the results of this study expand the gamut of suggestions that could address this challenge by considering the potential mismatch between safety and productivity goals, or productivity and quality goals. From an academic perspective, examining these climates in conjunction with one another allows us to draw from and contribute to the literature surrounding each, as well as conduct research with more practical applications.

For this particular sample, and the construction industry in general, the results of this study are important for understanding the impact of considering each of these goals in isolation. Productivity, quality, and safety are all of critical importance for the construction industry, and the role of leadership in creating these climates is also important. Therefore, it becomes necessary to create a mindset that doesn't see a tradeoff between these goals, but rather the integration of them. Past research already supports the importance of these climates individually, but the forward thinking organization will consider how to maximize each of these goals simultaneously to see the most benefits.

Limitations and Future Directions

One limitation of this study is the nature of the organization that participated in this research. This particular organization had a strong culture for safety, productivity, and quality, as well as a culture that supported the importance of all three. Although there was a clear ranking among the three, this high baseline could influence the findings through range restriction and decreased variance in the data. Although safety, productivity, and quality are important to this company, other construction organizations may not have the same levels of climate, or the same rank order between them. Future research should compare these results to organizations that are substantially lower in one or more of these climates, and assess any differences in the relationships between leadership, climate, and the outcomes.

On a similar note, the use of this sample could be seen as a limitation to the generalizability of the findings. The use of a construction sample is particularly appropriate to the current research study because of the fundamental relationship that exists between productivity, quality, and safety in this industry. Construction is a fast-paced, demanding industry with a continuous need to improve safety (Ringen, Englund, Welch, Weeks, & Seegal, 1995). Production demands are high, often exemplifying the tradeoff between productivity and safety. However, in order to build a positive reputation and continue contracting future projects, the quality of the work must be high and completed with few accidents or injuries. Leadership is also an important component of the construction industry. There is a clear hierarchy on the construction jobsite wherein novice workers are assigned to work with more senior professionals who oversee their work tasks and performance. The importance of safety, productivity, and quality, as well as the clear multi-level framework outlining the importance of leadership makes this an ideal industry for the current study. However, future research should assess these relationships in a variety of industries where the balance between these goals may look different (i.e., not all of three goals are as salient, or the rank order may vary). For example, in an industry where safety and quality are one and the same thing, as in the nuclear power industry (doing your job the right way means that no one gets hurt), the alignment or misalignment between the three goals presented here may affect outcomes in a different fashion.

Another limitation of the study is the lack of individual data to link with the outcomes. Confidentiality was a priority in this research project, which may limit some of the conclusions I was able to make. The majority of the data was collected at the individual level using a self-report survey, and the high correlation coefficients between these variables suggests that common method variance could inflate some of these relationships. However, by focusing on the work-group level, I was able to utilize key metrics for safety, productivity, and quality that the organization already had in place. Therefore, a limitation has also become a strength with the inclusion of non-self-report, forward-looking outcomes (collected a month after the survey). The effect sizes found for these predictive outcomes could be smaller than those found when measuring entirely concurrent data. Future research should strive to integrate existing organizational metrics in a predictive fashion to overcome limitations of common method variance and build on the benefits of data from other sources.

It is also necessary to address a variety of measurement issues that I encountered in this study. First is the potential lack of power that exists to test the relationships that I am interested in. The small sample size may have restricted my findings and ability to support my hypotheses, and this study should be used as a springboard to continue testing these relationships with larger samples. Due to the lack of power, it was necessary to make some concessions regarding the modeling of the data, and the measurement and path models had to be tested separately. The factor analysis results have been addressed above; however, it is still important to note that the removal of some of the items as well as the adaptation of the scales could have resulted in a reduction in construct validity. For the purposes of this study, adapting a climate scale to cover all three organizational goals was the most appropriate way to test my research questions. However, future research may consider using a different scale to adapt, or creating entirely new scales that are not only parallel but also cover the entire construct domains of safety, productivity, and quality climate, respectively.

One final direction for future research is to break down the climate and leadership constructs further to assess how different aspects of each of the climates relate (i.e. management values across all three foci) and identify the specific leader behaviors that create each of these climates. An understanding of how the components of leadership build the components of each climate can help both scientists and practitioners address how to begin building and integrating each of these climates. The present study provided the groundwork supporting the importance of the alignment of these climates, and future research should explore how to create this alignment.

Conclusion

The results of this study suggest that safety, productivity, and quality climate are all important to consider in our examination of important individual and organizational outcomes, and that all three climates can predict a variety of outcomes. Studying these climates in relation to one another provided additional evidence beyond studying them in isolation; the alignment between climates is critical to fostering employees that remain healthy and perform their jobs well. Leadership in an organization is important for fostering productivity, quality, and safety climates, and developing leaders that promote each of these climates could provide another avenue for obtaining the outcomes we wish to see. In order for organizations to adopt a thriving business model, key goals must be considered and addressed in an integrated fashion, rather than individually. An alignment between positive safety, productivity, and quality climates is an efficient technique for optimizing organizational success.

Table 1

Means, Standard Deviations, Correlations, and Reliabilities

Variable	M (SD)	1	2	3	4	5	6	7	8	9	10	11
1. Work group	--	--										
2. Age	--	.02	--									
3. Tenure (years)	3.82 (4.61)	.14	.36**	--								
4. Sup time (years)	1.06 (2.13)	.13	.10	.36**	--							
5. Health	3.67 (.79)	-.06	-.36**	-.25**	.05	--						
6. Job satisfaction	3.60 (.91)	-.01	-.19**	-.10	.01	.30**	--					
7. Work life balance	3.41 (1.04)	.04	-.08	-.09	-.07	.34**	.39**	--				
8. SR injuries	.17 (.57)	-.00	-.07	-.06	.06	.04	.04	.01	--			
9. SR near misses	.34 (.67)	-.06	.02	.02	.11	-.15*	.01	-.13	.54**	--		
10. OR safety	85.41 (19.23)	-.53**	-.11	.02	.07	.00	.09	-.03	.03	-.08	--	
11. Work ability	8.52 (1.27)	-.03	-.10	-.17*	-.00	.36**	.22**	.33**	-.17*	-.26**	.19*	(.87)
12. SR met productivity	2.82 (.82)	-.06	-.02	-.21**	-.04	.22**	.20**	.13	-.01	-.05	.20**	.30**
13. SR exceed productivity	2.27 (1.00)	.03	.07	-.11	.01	.18**	.14*	.20**	.10	.01	.18*	.23**
14. OR productivity	-981.35 (2373.60)	-.06	.03	.10	.06	-.16*	.03	.01	.06	.02	.51**	.04
15. SR met quality	3.16 (.70)	-.02	-.07	-.32**	-.11	.24**	.27**	.23**	-.03	-.02	.14	.39**
16. SR exceed quality	2.69 (.89)	.07	.03	-.13	.01	.26**	.25**	.22**	.02	-.03	.06	.35**
17. OR quality	83.50 (19.36)	-.40	-.12	.05	.09	-.01	.09	-.01	.05	-.08	.99**	.19**
18. OCB	3.46 (.79)	.00	.04	.18*	.15*	-.04	.19**	.10	.18*	.18**	.02	.07
19. Leadership	4.03 (.85)	.03	-.05	-.19**	-.09	.14*	.41**	.33**	-.00	-.08	-.05	.27**
20. SC – ME	4.54 (.61)	-.10	.04	.00	-.07	.01	.26**	.15*	-.10	-.11	.07	.21**
21. SC – FS	4.27 (.63)	-.02	.07	.04	.09	.02	.28**	.19**	-.12	-.19**	.09	.23**
22. QC – ME	4.30 (.66)	-.09	-.12	-.15*	.02	.25**	.43**	.36**	-.10	-.12	.09	.38**
23. QC – FS	3.78 (.91)	-.16*	-.12	-.17*	.06	.19**	.42**	.33**	.02	-.07	.25**	.36**
24. PC - ME	4.25 (.58)	-.04	-.24**	-.20**	.01	.17*	.29**	.24**	.04	-.02	.01	.31**
25. PC – FS	3.61 (.92)	-.13	-.20**	-.25**	.03	.25**	.44**	.32**	.07	-.06	.15*	.32**

Note. OR Outcomes were reported on vastly different scales than the other outcomes (Safety and Quality scores range from 1-100, Productivity ranges from -2,000 to 2,000). SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors, SC = Safety Climate, QC = Quality Climate, PC = Productivity Climate, ME = Management and Employee Involvement, FS = Formal Systems.

*$p < .05$ **$p < .01$.

Table 1 Continued

Means, Standard Deviations, Correlations, and Reliabilities

Variable	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Work group														
2. Age														
3. Tenure (years)														
4. Sup time (years)														
5. Health														
6. Job satisfaction														
7. Work life balance														
8. SR injuries														
9. SR near misses														
10. OR safety														
11. Work ability														
12. SR met productivity	--													
13. SR exceed productivity	.68**	--												
14. OR productivity	.16*	.27**	--											
15. SR met quality	.35**	.24**	.12	--										
16. SR exceed quality	.36**	.39**	.11	.56**	--									
17. OR quality	.19*	.18*	.53**	.15*	.08	--								
18. OCB	-.03	.06	.04	.02	.14*	.02	(.91)							
19. Leadership	.23**	.09	.02	.21**	.19**	-.05	.12	(.96)						
20. SC – ME	.09	.04	.02	.19**	.19**	.06	.13	.47**	(.78)					
21. SC – FS	.06	.07	-.05	.16*	.22**	.08	.13	.41**	.56**	(.81)				
22. QC – ME	.22**	.16*	-.03	.32**	.27**	.07	.15*	.64**	.53**	.49**	(.83)			
23. QC – FS	.27**	.19**	.06	.31**	.31**	.23*	.23**	.47**	.35**	.53**	.67**	(.91)		
24. PC - ME	.12	.11	-.12	.15*	.15*	.01	.09	.45**	.30**	.34**	.56**	.42**	(.58)	
25. PC – FS	.21**	.17*	.02	.25**	.26**	.13	.19**	.50**	.29**	.50**	.60**	.80**	.51**	(.93)

Note. OR Outcomes were reported on vastly different scales than the other outcomes (Safety and Quality scores range from 1-100, Productivity ranges from -2,000 to 2,000). SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors, SC = Safety Climate, QC = Quality Climate, PC = Productivity Climate, ME = Management and Employee Involvement, FS = Formal Systems.

*$p < .05$ **$p < .01$.

Table 2
Model Fit Statistics for Safety, Quality, and Productivity Climates

Description	Chi-square	df	CFI	RMSEA	$\Delta\chi^2$
Safety Climate					
1 Factor Full	137.08**	35	.84	.12	
1 Factor Reduced	90.80**	14	.85	.16	
2 Factor	22.22*	13	.98	.06	68.58**
Quality Climate					
1 Factor Full	233.25**	35	.84	.16	
1 Factor Reduced	145.64**	14	.87	.21	
2 Factor	40.73**	13	.97	.10	104.91**
Productivity Climate					
1 Factor Full	219.26**	35	.81	.16	
1 Factor Reduced	80.70**	14	.91	.15	
2 Factor	75.78**	13	.92	.15	4.92*

Note. SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors.
**p* < .05 ***p* < .01.

Table 3
Linear Regression Results for Management and Employee Involvement and Formal Systems for Safety Climate with Individual and Organizational Outcomes

	Predictor			
	Management & Communication		Formal Systems	
Outcome	β (SE)	B (SE)	β (SE)	B (SE)
Individual Outcomes				
Health[a]	.02 (.09)	.02 (.11)	.02 (.08)	.03 (.12)
Job Satisfaction[a]	.27** (.07)	.39** (.11)	.30** (.08)	.43** (.12)
Work-Life Balance	.13 (.07)	.22 (.12)	.16* (.08)	.27* (.14)
SR Injury	-.11 (.08)	-.10 (.07)	-.12 (.07)	-.11 (.07)
SR Near Miss	-.11 (.10)	-.12 (.11)	-.20* (.09)	-.21* (.09)
OR Safety	.07 (.09)	2.32 (2.95)	.09 (.12)	2.81 (3.80)
Work Ability[b]	.23* (.11)	.48* (.24)	.25** (.07)	.52** (.16)
Organizational Outcomes				
SR Met Productivity[b]	.09* (.05)	.12* (.06)	.07 (.06)	.09 (.08)
SR Exceeded Productivity	.04 (.08)	.05 (.11)	.03 (.06)	.06 (.13)
OR Productivity	.02 (.05)	74.73 (209.86)	-.05 (.05)	-202.34 (199.78)
SR Met Quality[b]	.19** (.04)	.22** (.05)	.17**(.05)	.20** (.06)
SR Exceeded Quality	.18** (.06)	.33** (.09)	.22** (.06)	.26** (.09)
OR Quality	.06 (.09)	1.87 (2.88)	.08 (.11)	2.48 (3.67)
OCB[b]	.12* (.06)	.16* (.08)	.12* (.06)	.15* (.08)

Note. N ranges from 162 – 203. Only coefficients for safety climate are presented for each model. OR Productivity scores ranged from -2,000 to 2,000, which explains the large unstandardized beta and standard deviation values for this variable. SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors.
[a]Age was included as a covariate in this model.
[b]Tenure was included as a covariate in this model.
*$p < .05$ **$p < .01$.

Table 4

Linear Regression Results for Management and Employee Involvement and Formal Systems for Productivity Climate with Individual and Organizational Outcomes

	Predictor			
	Management & Communication		Formal Systems	
Outcome	β (SE)	B (SE)	β (SE)	B (SE)
Individual Outcomes				
Health[a]	.09 (.08)	.14 (.12)	.18* (.07)	.16* (.06)
Job Satisfaction[a]	.21** (.07)	.33** (.11)	.42** (.06)	.40** (.05)
Work-Life Balance	.21* (.09)	.38* (.17)	.33** (.06)	.37** (.08)
SR Injury	.05 (.08)	.05 (.09)	.07 (.08)	.04 (.05)
SR Near Miss	-.01 (.10)	-.01 (.12)	-.06 (.11)	-.04 (.07)
OR Safety	.01 (.08)	.31 (2.87)	.15 (.08)	3.16 (1.99)
Work Ability[b]	.29** (.07)	.65** (.18)	.31** (.06)	.43** (.08)
Organizational Outcomes				
SR Met Productivity[b]	.04 (.09)	.05 (.14)	.17* (.07)	.15* (.06)
SR Exceeded Productivity	.10 (.07)	.18 (.12)	.16** (.06)	.17** (.06)
OR Productivity	-.12** (.04)	-507.69 (224.43)	.01 (.05)	27.56 (129.95)
SR Met Quality[b]	.12 (.13)	.08 (.09)	.19* (.09)	.14* (.07)
SR Exceeded Quality	.13 (.07)	.21 (.12)	.27** (.05)	.26** (.05)
OR Quality	.01 (.09)	.37 (3.09)	.13 (.08)	2.80 (1.94)
OCB[b]	.15* (.06)	.21* (.08)	.25** (.06)	.21** (.06)

Note. N ranges from 158 – 197. Only coefficients for productivity climate are presented for each model. OR Productivity scores ranged from -2,000 to 2,000, which explains the large unstandardized beta and standard deviation values for this variable. SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors.

[a]Age was included as a covariate in this model.

[b]Tenure was included as a covariate in this model.

*$p < .05$ **$p < .01$.

Table 5
Linear Regression Results for Management and Employee Involvement and Formal Systems for Quality Climate with Individual and Organizational Outcomes

	Predictor			
	Management & Communication		Formal Systems	
Predictor	β (SE)	B (SE)	β (SE)	B (SE)
Individual Outcomes				
Health[a]	.22** (.07)	.28** (.09)	.16* (.06)	.14* (.06)
Job Satisfaction[a]	.39** (.07)	.52** (.06)	.40** (.07)	.39** (.07)
Work-Life Balance	.35** (.06)	.55** (.09)	.32** (.07)	.37** (.08)
SR Injury	-.00 (.06)	-.00 (.05)	.02 (.08)	.01 (.05)
SR Near Miss	-.12 (.12)	-.11 (.11)	-.05 (.07)	-.05 (.07)
OR Safety	.09 (.09)	2.51 (2.77)	.25** (.09)	5.28* (2.27)
Work Ability[b]	.35** (.08)	.68** (.17)	.35** (.05)	.50** (.07)
Organizational Outcomes				
SR Met Productivity[b]	.16* (.07)	.20* (.09)	.24** (.06)	.22** (.05)
SR Exceeded Productivity	.16* (.07)	.24* (.10)	.17** (.06)	.19** (.07)
OR Productivity	-.03 (.08)	-118.39 (278.88)	.06 (.07)	166.19 (194.41)
SR Met Quality[b]	.26** (.10)	.28* (.11)	.26** (.08)	.20** (.06)
SR Exceeded Quality	.25** (.08)	.33** (.12)	.31** (.06)	.30** (.07)
OR Quality	.07 (.09)	2.02 (2.77)	.23** (.09)	4.91* (2.21)
OCB[b]	.18** (.06)	.21** (.07)	.26** (.07)	.23** (.07)

Note. N ranges from 160 – 200. Only coefficients for quality climate are presented for each model. OR Productivity scores ranged from -2,000 to 2,000, which explains the large unstandardized beta and standard deviation values for this variable. SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors.
[a]Age was included as a covariate in this model.
[b]Tenure was included as a covariate in this model.
**p* < .05 ***p* < .01.

Table 6
Summary of Findings for Individual Outcomes

Outcome		Safety and Productivity B(SE)		Productivity and Quality B(SE)		Safety and Quality B(SE)	
		ME	FS	ME	FS	ME	FS
Health	Agreement	--	--	.15(.39)	.15(.15)	-.07(.40)	--
	Size of Discrepancy	--	--	-.86*(.39)	-.10(.15)	-.36(.40)	--
	Direction of Discrepancy	--	--	.45(.27)	-.21(.15)	-.52*(.22)	--
Satisfaction	Agreement	--	--	--	.54**(.11)	--	.66(.62)
	Size of Discrepancy	--	--	--	.18(.11)	--	-.41(.62)
	Direction of Discrepancy	--	--	--	.29(.17)	--	.26(.34)
Work Life Balance	Agreement	--	.93*(.45)	--	.49*(.20)	.95**(.35)	.87*(.36)
	Size of Discrepancy	--	.62 (.45)	--	.32(.20)	-.51(.35)	.44(.36)
	Direction of Discrepancy	--	-.65*(.26)	--	.20(.28)	.02(.26)	-.35(.27)
SR Injury	Agreement	.54 (.29)	--	--	--	--	.12(.36)
	Size of Discrepancy	.33 (.29)	--	--	--	--	-.96**(.36)
	Direction of Discrepancy	.45*(.18)	--	--	--	--	.82**(.25)
SR Near Misses	Agreement	--	--	-.23(.31)	--	-.36(.26)	--
	Size of Discrepancy	--	--	1.00**(.31)	--	.76**(.26)	--
	Direction of Discrepancy	--	--	-.16(.17)	--	-.14(.21)	--
OR Safety	Agreement	--	--	--	8.16(3.20)	--	12.22(10.65)
	Size of Discrepancy	--	--	--	-12.64(3.20)	--	-11.25(10.65)
	Direction of Discrepancy	--	--	--	-13.41(4.87)	--	.49(5.39)
Work Ability	Agreement	--	--	--	.53(.28)	--	--
	Size of Discrepancy	--	--	--	-.69(.28)	--	--
	Direction of Discrepancy	--	--	--	.46(.25)	--	--

Note. Betas reported are unstandardized. Statistics not reported are within models where the overall R^2 was not significant. ME = Management and employee involvement, FS = Formal systems, SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors.
*$p < .05$ **$p < .01$.

Table 7
Summary of Findings for Organizational Outcomes

Outcome		Safety and Productivity B(SE)		Productivity and Quality B(SE)		Safety and Quality B(SE)	
		ME	FS	ME	FS	ME	FS
SR Met Productivity	Agreement	--	--	.45(.49)	.29*(.14)	--	--
	Size of Discrepancy	--	--	-.78(.49)	-.39**(.14)	--	--
	Direction of Discrepancy	--	--	.60**(.22)	.40*(.17)	--	--
SR Exceeded Productivity	Agreement	--	--	--	--	--	-.36(.48)
	Size of Discrepancy	--	--	--	--	--	-1.80**(.48)
	Direction of Discrepancy	--	--	--	--	--	.65*(.29)
OR Productivity	Agreement	--	--	--	--	--	--
	Size of Discrepancy	--	--	--	--	--	--
	Direction of Discrepancy	--	--	--	--	--	--
SR Met Quality	Agreement	-.79(.53)	-.30(.37)	--	.20(.17)	-.44(.23)	-.35(.30)
	Size of Discrepancy	.29(.53)	-.04(.37)	--	-.30(.17)	.52*(.23)	.07(.30)
	Direction of Discrepancy	-.26(.28)	-.12(.21)	--	.15(.24)	-.73(1.39)	-.43*(.21)
SR Exceeded Quality	Agreement	--	--	--	.16(.19)	--	-.14(.15)
	Size of Discrepancy	--	--	--	-.46*(.19)	--	.09(.16)
	Direction of Discrepancy	--	--	--	.01(.17)	--	-.31(.20)
OR Quality	Agreement	--	--	--	7.52*(3.31)	--	--
	Size of Discrepancy	--	--	--	-13.39**(3.31)	--	--
	Direction of Discrepancy	--	--	--	-13.62**(5.12)	--	--
OCB	Agreement	1.01(.58)	1.33**(.32)	--	--	1.06**(.37)	.58(.29)
	Size of Discrepancy	1.10(.58)	1.41**(.32)	--	--	.27(.37)	-.50(.29)
	Direction of Discrepancy	.23(.28)	-.05(.23)	--	--	.23(.23)	.45*(.19)

Note. Betas reported are unstandardized. Statistics not reported are within models where the overall R^2 was not significant. ME = Management and employee involvement, FS = Formal systems, SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors.
$*p < .05$ $**p < .01$.

Table 8
Polynomial Regression Results for Management and Employee Involvement in Safety and Productivity with Individual Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
Health	Constant	5.00** (.59)	4.32** (.35)	Satisfaction	Constant	4.05** (.35)	3.56** (.44)
	Age	-.31** (.07)	-.25** (.06)		Age	-.17* (.07)	-.15** (.05)
	S	.04 (.20)	.05 (.29)		S	-.44 (.26)	-.07 (.38)
	P	-.16 (.20)	-.25 (.33)		P	-.00 (.33)	-.01 (.52)
	SP	-.09 (.20)	-.06 (.12)		SP	.17 (.38)	.11 (.27)
	S^2	-.01 (.20)	-.01 (.12)		S^2	.16 (.24)	.10 (.15)
	P^2	.33* (.17)	.21 (.13)		P^2	.03 (.17)	.02 (.11)
Work Life Balance	Constant	2.34** (.54)	2.65** (.33)	SR Injury	Constant	-.22 (.15)	-.16 (.13)
	S	.24 (.19)	.44 (.32)		S	.37** (.10)	.44* (.20)
	P	.26 (.15)	.51 (.32)		P	.08 (.17)	.10 (.21)
	SP	-.04 (.20)	-.03 (.17)		SP	-.59 (.19)	-.32** (.11)
	S^2	-.18 (.15)	-.14 (.13)		S^2	-.14 (.16)	-.07 (.09)
	P^2	-.04 (.23)	-.04 (.20)		P^2	.38 (.16)	.20* (.10)
OR Safety	Constant	3.36** (1.25)	73.85** (11.5)	SR Near Misses	Constant	.83 (.44)	.55 (.31)
	S	.36** (.13)	12.94 (6.97)		S	-.10 (.23)	-.11 (.25)
	P	.05 (.21)	1.83 (8.06)		P	.07 (.24)	.08 (.27)
	SP	-.30* (.19)	-6.59 (4.18)		SP	.36 (.19)	.18 (.11)
	S^2	-.08 (.19)	-1.25 (2.89)		S^2	-.21 (.18)	-.10 (.08)
	P^2	.20 (.15)	3.25 (2.22)		P^2	-.28 (.28)	-.14 (.13)
Work Ability	Constant	4.59* (2.24)	6.97** (.84)				
	Tenure	-.12* (.06)	-.00** (.00)				
	S	.46 (.25)	1.15 (1.02)				
	P	.19 (.18)	.51 (.52)				
	SP	-.34 (.22)	-.39 (.35)				
	S^2	-.15 (.24)	-.16 (.30)				
	P^2	.25 (.21)	.28 (.27)				

Note. N ranges from 188 – 197. OR Outcomes were reported on vastly different scales than the other outcomes (Safety and Quality scores range from 1-100). S = Safety, P = Productivity, SR = Self-reported, OR = Organization-reported.
** $p < .01$ * $p < .05$.

Table 9
Polynomial Regression Results for Management and Employee Involvement in Safety and Productivity with Organizational Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
SR Met Productivity	Constant	3.26** (.89)	2.66** (.41)	SR Met Quality	Constant	3.93** (.68)	3.61** (.24)
	Tenure	-.22** (.08)	-.00** (.00)		Tenure	-.22** (.07)	-.00** (.00)
	S	.11 (.19)	.14 (.26)		S	-.17 (.21)	-.25 (.31)
	P	.10 (.35)	.14 (.50)		P	-.34 (.22)	-.54 (.43)
	SP	-.20 (.24)	-.12 (.16)		SP	.46* (.21)	.32* (.14)
	S^2	.07 (.16)	.04 (.09)		S^2	.05 (.16)	.03 (.11)
	P^2	.05 (.31)	.03 (.18)		P^2	.04 (.31)	.03 (.21)
SR Exceeded Productivity	Constant	1.99** (.68)	1.97** (.48)	SR Exceeded Quality	Constant	2.19** (.56)	2.38** (.52)
	S	.01 (.22)	.02 (.37)		S	.31 (.27)	.55 (.51)
	P	.19 (.30)	.32 (.53)		P	-.39* (.19)	-.73 (.45)
	SP	-.10 (.19)	-.01 (.14)		SP	-.08 (.27)	-.06 (.22)
	S^2	-.02 (.19)	-.01 (.13)		S^2	-.14 (.16)	-.11 (.13)
	P^2	-.07 (.27)	-.05 (.20)		P^2	.52** (.20)	.42 (.22)
OR Productivity	Constant	-.17 (.46)	-439.27 (1180.79)	OR Quality	Constant	3.23** (1.07)	72.78** (11.47)
	S	.18 (.22)	772.93 (929.06)		S	.39** (.12)	14.36* (7.03)
	P	-.29 (.22)	-1773.60 (1478.72)		P	.00 (.21)	.04 (8.17)
	SP	-.10 (.28)	-195.39 (553.54)		SP	-.38 (.20)	-6.56 (4.11)
	S^2	-.07 (.14)	-132.20 (257.72)		S^2	-.14 (.20)	-2.15 (3.17)
	P^2	.33 (.22)	656.44 (568.35)		P^2	.26 (.15)	4.25 (2.28)
OCB	Constant	2.27* (.92)	2.59** (.38)				
	Tenure	.13 (.07)	.00* (.00)				
	S	.56** (.08)	1.06* (.41)				
	P	-.02 (.21)	-.04 (.41)				
	SP	-.29 (.15)	-.25 (.19)				
	S^2	-.38** (.10)	-.30* (.13)				
	P^2	.33 (.22)	.28 (.18)				

Note. N ranges from 195 – 197. OR Outcomes were reported on vastly different scales than the other outcomes (Productivity ranges from -2,000 to 2,000). S = Safety, P = Productivity, SR = Self-reported, OR = Organization-reported.
$^{**}p < .01$ $^{*}p < .05$.

Table 10
Response Surface Tests for Management an Employee Involvement in Safety and Productivity

Model	Surface Test	Coefficient	SE
SR Met Quality	a_1	-.79	.53
	a_2	.38	.28
	a_3	.29	.53
	a_4	-.26	.28
SR Injury	a_1	.54	.29
	a_2	-.19	.18
	a_3	.33	.29
	a_4	.45*	.18
OCB	a_1	1.01	.58
	a_2	-.28	.28
	a_3	1.10	.58
	a_4	.23	.28

Note. $\mathbf{a}_1$ = slope along the line of agreement; ($\mathbf{b}_1 + \mathbf{b}_2$), where $\mathbf{b}_1$ is beta coefficient for safety (S) and $\mathbf{b}_2$ is beta coefficient for productivity (P). $\mathbf{a}_2$ = curvature along the line of agreement; ($\mathbf{b}_3 + \mathbf{b}_4 + \mathbf{b}_5$), where $\mathbf{b}_3$ is beta coefficient for S squared, $\mathbf{b}_4$ is beta coefficient for the cross-product of S and P, and $\mathbf{b}_5$ is beta coefficient for P squared. $\mathbf{a}_3$ = slope along the line of disagreement; ($\mathbf{b}_1 - \mathbf{b}_2$), $\mathbf{a}_4 = (\mathbf{b}_3 - \mathbf{b}_4 + \mathbf{b}_5)$, **SE =** standard error, **SR** = Self-reported, **OR =** Organization-reported.
$^{**}p < .01$ $^{*}p < .05$.

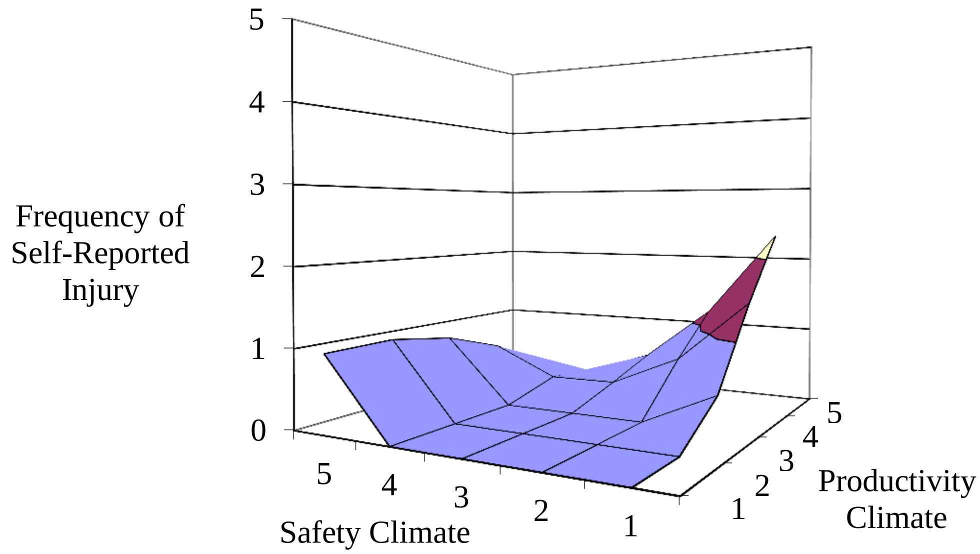

Figure 1. Frequency of Self-Reported Injury as Predicted by the Discrepancy between Management and Employee Involvement in Safety and Productivity Climates

Table 11
Polynomial Regression Results for Formal Systems for Safety and Productivity with Individual Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
Health	Constant	5.08** (.61)	4.22** (.27)	Satisfaction	Constant	3.61** (.68)	3.41** (.25)
	Age	-.3** (.07)	-.24** (.05)		Age	-.13* (.06)	-.11* (.05)
	S	.10 (.24)	.13 (.34)		S	.25 (.31)	.39 (.52)
	P	.01 (.15)	.01 (.14)		P	.38* (.19)	.39* (.18)
	SP	.12 (.17)	.07 (.10)		SP	-.01 (.25)	-.01 (.16)
	S^2	-.20 (.26)	-.12 (.15)		S^2	-.13 (.34)	-.09 (.23)
	P^2	.13 (.11)	.07 (.06)		P^2	-.07 (.08)	-.04 (.06)
Work Life Balance	Constant	2.45** (.44)	2.95** (.22)	SR Injury	Constant	.46** (.12)	.32* (.14)
	S	.40** (.15)	.77* (.38)		S	-.30 (.20)	-.34 (.30)
	P	.12 (.18)	.16 (.23)		P	.51** (.18)	.39 (.22)
	SP	.25 (.21)	.21 (.18)		SP	-.61** (.20)	-.29 (.16)
	S^2	-.44* (.17)	-.37* (.17)		S^2	.26 (.23)	.12 (.14)
	P^2	-.09 (.08)	-.08 (.07)		P^2	.17 (.12)	.08 (.07)
OR Safety	Constant	4.05** (1.29)	82.26** (9.85)	SR Near Misses	Constant	.81** (.18)	.53** (.12)
	S	.15 (.28)	4.88 (9.64)		S	-.11 (.22)	-.11 (.24)
	P	.20 (.17)	4.37 (4.04)		P	-.02 (.25)	-.02 (.18)
	SP	.01 (.16)	.20 (2.23)		SP	-.01 (.25)	-.00 (.11)
	S^2	-.12 (.25)	-1.73 (3.58)		S^2	-.10 (.25)	-.05 (.11)
	P^2	-.15 (.16)	-2.09 (2.32)		P^2	.09 (.15)	.04 (.07)
Work Ability	Constant	5.99** (1.25)	7.87** (.31)				
	Tenure	-.15** (.05)	-.00** (.00)				
	S	.37 (.20)	.77 (.57)				
	P	-.06 (.24)	-.08 (.36)				
	SP	.22 (.20)	.20 (.20)				
	S^2	-.24 (.25)	-.22 (.26)				
	P^2	.10 (.11)	.09 (.11)				

Note. N ranges from 187 – 196. S = Safety, P = Productivity, SR = Self-reported, OR = Organization-reported. $^{**}p < .01$ $^{*}p < .05$. OR Outcomes were reported on vastly different scales than the other outcomes (Safety scores range from 1-100).

Table 12
Polynomial Regression Results for Formal Systems for Safety and Productivity with Organizational Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
SR Met Productivity	Constant	3.71** (.38)	3.98** (.17)	SR Met Quality	Constant	4.22** (.45)	3.27** (.14)
	Tenure	-.17* (.07)	-.00* (.00)		Tenure	-.25** (.08)	-.00** (.00)
	S	-.16 (.23)	-.21 (.31)		S	-.13 (.27)	-.17 (.33)
	P	.16 (.21)	.14 (.19)		P	-.16 (.19)	-.13 (.16)
	SP	.11 (.23)	.06 (.12)		SP	.36 (.25)	.19 (.14)
	S^2	.11 (.25)	.06 (.14)		S^2	.20 (.28)	.10 (.15)
	P^2	-.09 (.11)	-.05 (.06)		P^2	-.07 (.11)	-.04 (.06)
SR Exceeded Productivity	Constant	2.29** (.29)	2.41** (.16)	SR Exceeded Quality	Constant	2.47** (.35)	2.29** (.24)
	S	-.32 (.18)	-.54 (.37)		S	.11 (.29)	.17 (.44)
	P	.33 (.17)	.37 (.24)		P	-.16 (.15)	-.16 (.16)
	SP	-.20 (.23)	-.14 (.18)		SP	.32 (.17)	.20 (.12)
	S^2	.30 (.20)	.21 (.17)		S^2	-.01 (.31)	-.01 (.20)
	P^2	.03 (.11)	.02 (.08)		P^2	.12 (.11)	.08 (.07)
OR Productivity	Constant	-.03 (.18)	-84.69 (482.38)	OR Quality	Constant	4.05** (1.16)	80.97** (9.88)
	S	-.39** (.14)	-1697.16 (1028.07)		S	.12 (.29)	3.75 (9.66)
	P	.18 (.14)	528.52 (469.05)		P	.16 (.17)	3.50 (3.82)
	SP	-.01 (.19)	-25.99 (341.91)		SP	.04 (.16)	.48 (2.16)
	S^2	.35 (.20)	640.70 (504.34)		S^2	-.09 (.25)	-1.27 (3.58)
	P^2	-.16 (.16)	-305.72 (309.55)		P^2	-.14 (.16)	-1.93 (2.32)
OCB	Constant	3.38** (.57)	3.08** (.13)				
	Tenure	.17* (.07)	.00* (.00)				
	S	.10 (.18)	.15 (.28)				
	P	.41** (.12)	.40* (.16)				
	SP	-.36* (.16)	-.22* (.11)				
	S^2	-.08 (.21)	-.05 (.13)				
	P^2	.17 (.09)	.11* (.05)				

Note. N ranges from 194 – 196. S = Safety, P = Productivity, SR = Self-reported, OR = Organization-reported.
$^{**}p < .01$ $^{*}p < .05$. OR Outcomes were reported on vastly different scales than the other outcomes (Productivity ranges from -2,000 to 2,000; Quality ranges from 1-100).

Table 13
Response Surface Tests for Formal Systems for Safety and Productivity

Model	Surface Test	Coefficient	SE
Work Life Balance	a_1	.93*	.45
	a_2	-.24	.26
	a_3	.62	.45
	a_4	-.65*	.26
SR Met Quality	a_1	-.30	.37
	a_2	.25	.21
	a_3	-.04	.37
	a_4	-.12	.21
OCB	a_1	1.33**	.32
	a_2	-.37	.23
	a_3	1.41**	.32
	a_4	-.05	.23

Note. $\mathbf{a}_1$ = slope along the line of agreement; ($\mathbf{b}_1 + \mathbf{b}_2$), where $\mathbf{b}_1$ is beta coefficient for safety (S) and $\mathbf{b}_2$ is beta coefficient for productivity (P). $\mathbf{a}_2$ = curvature along the line of agreement; ($\mathbf{b}_3 + \mathbf{b}_4 + \mathbf{b}_5$), where $\mathbf{b}_3$ is beta coefficient for S squared, $\mathbf{b}_4$ is beta coefficient for the cross-product of S and P, and $\mathbf{b}_5$ is beta coefficient for P squared. $\mathbf{a}_3$ = slope along the line of disagreement; ($\mathbf{b}_1 - \mathbf{b}_2$), $\mathbf{a}_4$ = ($\mathbf{b}_3 - \mathbf{b}_4 + \mathbf{b}_5$), **SE =** standard error, **SR** = Self-reported, **OR =** Organization-reported.
**$p < .01$ *$p < .05$.

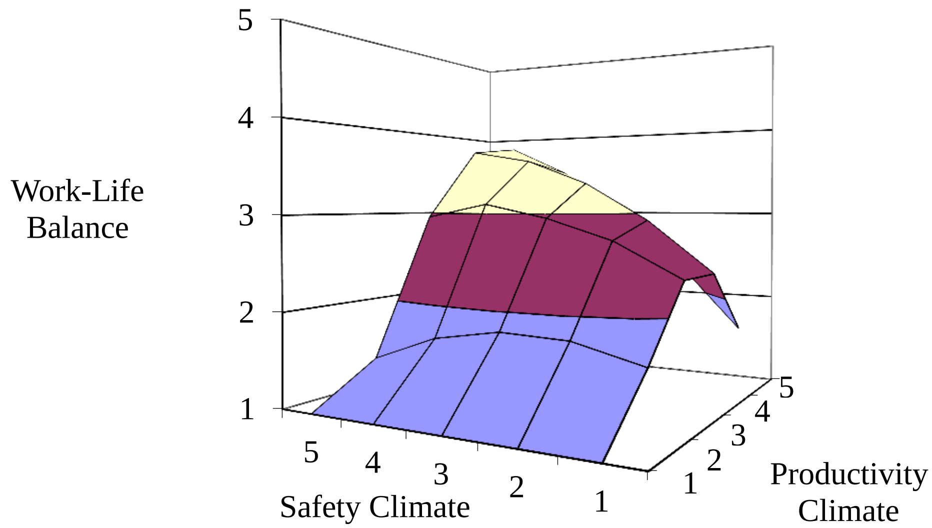

Figure 2. Employee Work-Life Balance as Predicted by the Discrepancy between Formal Systems for Safety and Productivity Climates

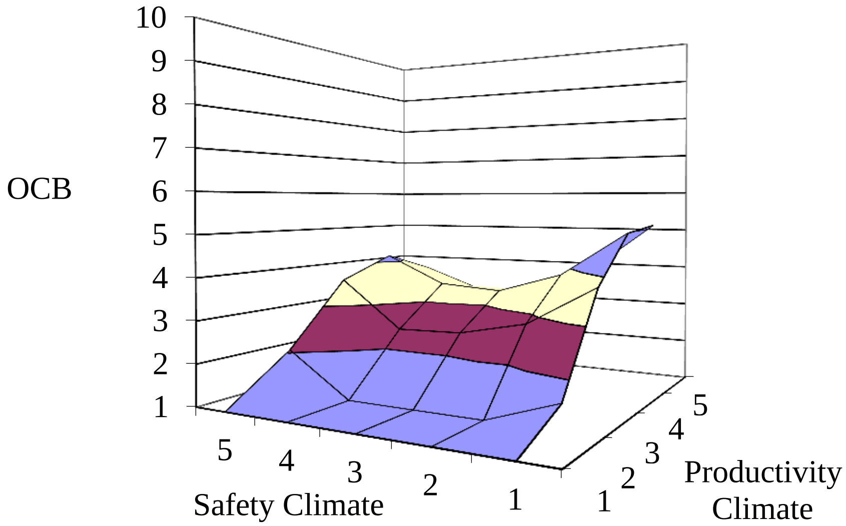

Figure 3. Organizational Citizenship Behaviors as Predicted by the Discrepancy between Formal Systems for Safety and Productivity Climates

Table 14
Polynomial Regression Results for Management and Employee Involvement in Productivity and Quality with Individual Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
Health	Constant	4.61** (.43)	4.05** (.25)	Satisfaction	Constant	3.16** (.81)	3.08** (.27)
	Age	-.33** (.07)	-.27** (.06)		Age	-.14** (.05)	-.13** (.05)
	P	-.22 (.20)	-.36 (.34)		P	.13 (.26)	.23 (.48)
	Q	.38** (.13)	.51** (.19)		Q	.47** (.15)	.69* (.27)
	PQ	-.30 (.28)	-.19 (.18)		PQ	-.06 (.19)	-.04 (.14)
	P^2	.38 (.23)	.25 (.17)		P^2	-.05 (.27)	-.04 (.20)
	Q^2	.01 (.19)	.01 (.12)		Q^2	-.11 (.16)	-.07 (.12)
Work Life Balance	Constant	2.04** (.49)	2.44** (.27)	SR Injury	Constant	.35 (.22)	.21 (.14)
	P	.24 (.14)	.50 (.33)		P	-.18 (.18)	-.19 (.21)
	Q	.36* (.16)	.64* (.33)		Q	.15 (.15)	.14 (.14)
	PQ	.00 (.24)	.00 (.21)		PQ	.01 (.20)	.01 (.09)
	P^2	-.18 (.27)	-.16 (.23)		P^2	.29 (.25)	.13 (.13)
	Q^2	-.10 (.13)	-.09 (.12)		Q^2	-.26** (.08)	-.11** (.03)
OR Safety	Constant	3.62** (1.21)	79.16 (10.94)	SR Near Misses	Constant	.62** (.21)	.48* (.21)
	P	-.07 (.25)	-2.87 (9.36)		P	.28 (.19)	.39 (.23)
	Q	.41** (.10)	13.54** (4.83)		Q	-.53** (.13)	-.62** (.20)
	PQ	-.25 (.25)	-4.06 (4.12)		PQ	.21 (.16)	.12 (.11)
	P^2	.23 (.28)	3.72 (4.13)		P^2	-.39 (.24)	-.22 (.13)
	Q^2	-.22 (.19)	-3.46 (2.88)		Q^2	.33 (.06)	.18 (.04)
Work Ability	Constant	4.52** (1.09)	7.43** (.38)				
	Tenure	-.11* (.05)	-.00* (.00)				
	P	-.03 (.18)	-.07 (.45)				
	Q	.52* (.22)	1.07 (.57)				
	PQ	-.26 (.37)	-.27 (.39)				
	P^2	.32 (.30)	.32 (.33)				
	Q^2	-.11 (.23)	-.10 (.23)				

Note. N ranges from 186 – 195. OR Outcomes were reported on vastly different scales than the other outcomes (Safety scores range from 1-100). P = Productivity, Q = Quality, SR = Self-reported, OR = Organization-reported.
** $p < .01$ * $p < .05$.

Table 15
Polynomial Regression Results for Management and Employee Involvement in Productivity and Quality with Organizational Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
SR Met Productivity	Constant	2.84** (.71)	2.52** (.32)	SR Met Quality	Constant	4.38** (.49)	3.14** (.38)
	Tenure	-.17* (.07)	-.00* (.00)		Tenure	-.29** (.09)	-.00** (.00)
	P	-.11 (.29)	-.17 (.44)		P	-.23 (.38)	-.29 (.53)
	Q	.46** (.14)	.62** (.21)		Q	.14 (.29)	.15 (.30)
	PQ	-.54** (.14)	.21 (.17)		PQ	-.13 (.31)	-.07 (.15)
	P^2	.32 (.27)	-.35** (.11)		P^2	.15 (.30)	.08 (.17)
	Q^2	.06 (.15)	.04 (.09)		Q^2	.30 (.24)	.15 (.12)
SR Exceeded Productivity	Constant	1.49** (.42)	1.56** (.25)	SR Exceeded Quality	Constant	2.30** (.32)	2.37** (.33)
	P	.10 (.22)	.19 (.42)		P	-.45** (.13)	-.83* (.36)
	Q	.29 (.19)	.46 (.33)		Q	.32 (.21)	.49 (.30)
	PQ	-.62** (.19)	.14 (.22)		PQ	-.66* (.26)	.58** (.18)
	P^2	.19 (.30)	-.48** (.15)		P^2	.76** (.16)	-.50** (.18)
	Q^2	.29 (.24)	.21 (.16)		Q^2	.35 (.10)	.25** (.08)
OR Productivity	Constant	.01 (.25)	16.16 (701.73)	OR Quality	Constant	3.57** (1.10)	78.13** (11.42)
	P	-.49** (.15)	-2493.27 (1558.27)		P	-.11 (.27)	-4.41 (9.96)
	Q	.11 (.11)	473.49 (491.29)		Q	.41** (.11)	13.35** (5.02)
	PQ	-.40 (.23)	-844.05 (525.27)		PQ	-.29 (.25)	-4.66 (4.26)
	P^2	.55* (.22)	1162.73 (788.03)		P^2	.31 (.29)	5.00 (4.25)
	Q^2	.20 (.16)	405.42 (302.09)		Q^2	-.22 (.19)	-3.46 (2.97)
OCB	Constant	3.97** (.37)	3.18** (.30)				
	Tenure	.19* (.08)	.00* (.00)				
	P	-.13 (.28)	-.18 (.41)				
	Q	.11 (.31)	.14 (.38)				
	PQ	.20 (.26)	.12 (.15)				
	P^2	.14 (.29)	.08 (.18)				
	Q^2	-.14 (.22)	-.08 (.13)				

Note. N ranges from 193 – 195. OR Outcomes were reported on vastly different scales than the other outcomes (Productivity ranges from -2,000 to 2,000; Quality ranges from 1-100). P = Productivity, Q = Quality, SR = Self-reported, OR = Organization-reported.
***p* < .01 **p* < .05.

Table 16

Response Surface Tests for Management and Employee Involvement in Productivity and Quality

Model	Surface Test	Coefficient	SE
Health	a_1	.15	.39
	a_2	.07	.27
	a_3	-.86*	.39
	a_4	.45	.27
SR Met Productivity	a_1	.45	.49
	a_2	-.11	.22
	a_3	-.78	.49
	a_4	.60**	.22
SR Near Miss	a_1	-.23	.31
	a_2	.08	.17
	a_3	1.00**	.31
	a_4	-.16	.17

Note. $\mathbf{a}_1$ = slope along the line of agreement; ($\mathbf{b}_1 + \mathbf{b}_2$), where $\mathbf{b}_1$ is beta coefficient for productivity (P) and $\mathbf{b}_2$ is beta coefficient for quality (Q). $\mathbf{a}_2$ = curvature along the line of agreement; ($\mathbf{b}_3 + \mathbf{b}_4 + \mathbf{b}_5$), where $\mathbf{b}_3$ is beta coefficient for P squared, $\mathbf{b}_4$ is beta coefficient for the cross-product of P and Q, and $\mathbf{b}_5$ is beta coefficient for Q squared. $\mathbf{a}_3$ = slope along the line of disagreement; ($\mathbf{b}_1 - \mathbf{b}_2$), $\mathbf{a}_4$ = ($\mathbf{b}_3 - \mathbf{b}_4 + \mathbf{b}_5$), **SE =** standard error, **SR** = Self-reported, **OR =** Organization-reported.

$^{**}p < .01$ $^{*}p < .05$.

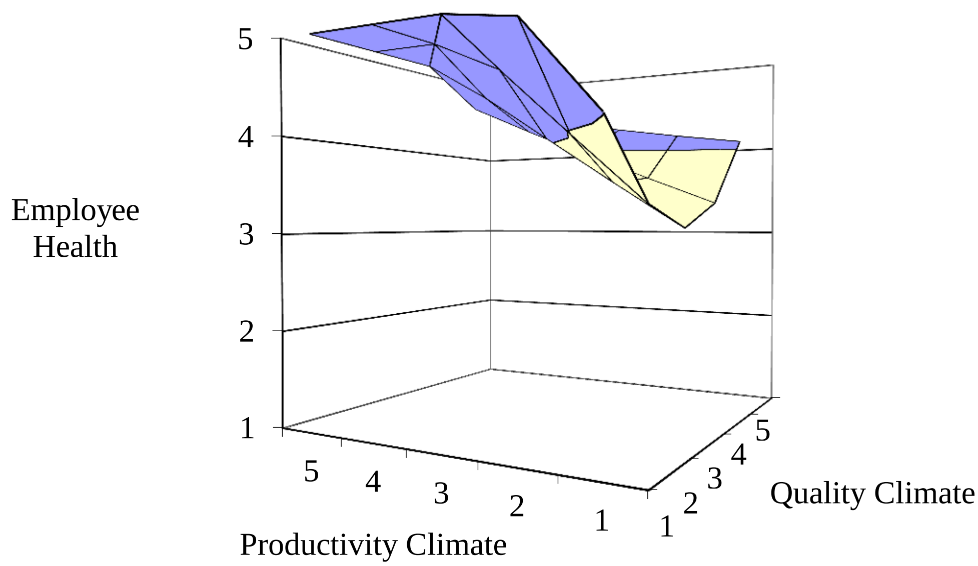

Figure 4. Employee Health as Predicted by the Discrepancy between Management and Employee Involvement in Productivity and Quality Climates

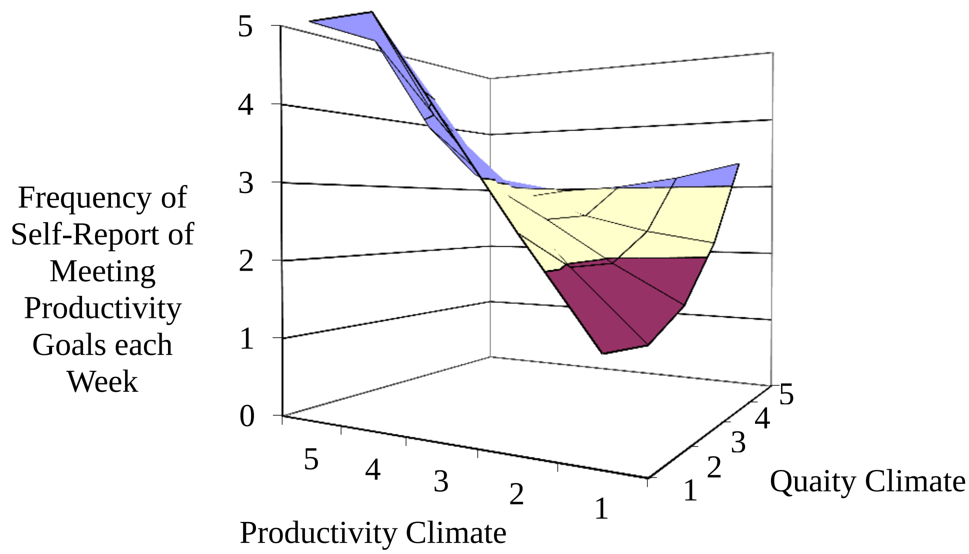

Figure 5. Frequency of Self-Report of Meeting Productivity Goals each Week as Predicted by the Discrepancy between Management and Employee Involvement in Productivity and Quality Climates

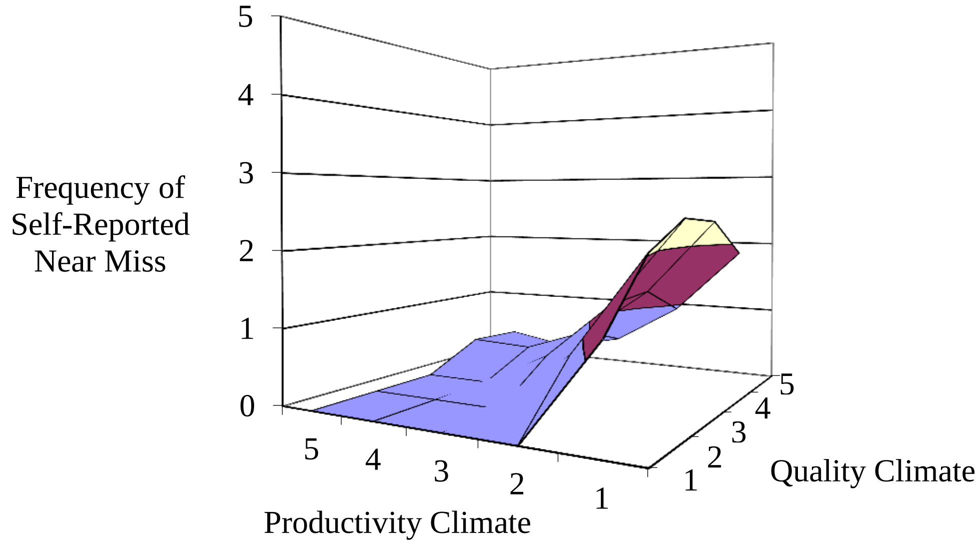

Figure 6. Frequency of Self-Reported Near Miss as Predicted by the Discrepancy between Productivity and Quality Climates

Table 17
Polynomial Regression Results for Formal Systems for Productivity and Quality with Individual Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
Health	Constant	5.18** (.23)	4.27** (.19)	Satisfaction	Constant	3.92** (.34)	3.58** (.18)
	Age	-.33** (.07)	-.26** (.06)		Age	-.12* (.06)	-.10* (.05)
	P	.03 (.13)	.02 (.12)		P	.36** (.08)	.36** (.08)
	Q	.14 (.10)	.13 (.09)		Q	.18* (.07)	.18* (.07)
	PQ	.19 (.18)	.11 (.11)		PQ	-.28 (.18)	.04 (.08)
	P^2	.11 (.12)	.06 (.07)		P^2	.06 (.12)	-.18 (.12)
	Q^2	-.27 (.15)	-.16 (.09)		Q^2	.11 (.12)	.07 (.08)
Work Life Balance	Constant	2.92** (.21)	3.14** (.10)	SR Injury	Constant	.33** (.11)	.19** (.06)
	P	.35** (.13)	.40* (.16)		P	.08 (.15)	.05 (.10)
	Q	.07 (.10)	.09 (.11)		Q	-.04 (.10)	-.02 (.07)
	PQ	-.17 (.29)	-.13 (.23)		PQ	.20 (.20)	.08 (.08)
	P^2	-.09 (.17)	-.07 (.13)		P^2	.01 (.10)	.01 (.04)
	Q^2	.18 (.15)	.14 (.10)		Q^2	-.21* (.08)	-.09** (.03)
OR Safety	Constant	4.14** (.82)	84.30** (5.72)	SR Near Misses	Constant	.53** (.15)	.35** (.08)
	P	-.10 (.13)	-2.24 (2.72)		P	-.03 (.11)	-.02 (.08)
	Q	.46** (.09)	10.40** (1.68)		Q	-.15 (.10)	-.11 (.08)
	PQ	.34 (.25)	4.99 (3.23)		PQ	.23 (.17)	.11 (.08)
	P^2	-.21 (.15)	-3.05 (2.28)		P^2	-.13 (.16)	-.06 (.07)
	Q^2	-.37 (.23)	5.37 (2.85)		Q^2	.05 (.13)	.02 (.06)
Work Ability	Constant	6.45** (.53)	8.16** (.14)				
	Tenure	-.13** (.05)	-.00** (.00)				
	P	-.06 (.18)	-.08 (.24)				
	Q	.44** (.10)	.61** (.15)				
	PQ	-.23 (.23)	-.21 (.21)				
	P^2	.30** (.11)	.27** (.09)				
	Q^2	-.03 (.12)	-.03 (.11)				

Note. N ranges from 186 – 195. OR Outcomes were reported on vastly different scales than the other outcomes (Safety scores range from 1-100). P = Productivity, Q = Quality, SR = Self-reported, OR = Organization-reported.
**$p < .01$ *$p < .05$.

Table 18
Polynomial Regression Results for Formal Systems for Productivity and Quality with Organizational Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
SR Met Productivity	Constant	3.32** (.34)	2.72** (.11)	SR Met Quality	Constant	4.54** (.29)	3.15** (.12)
	Tenure	-.15* (.07)	-.00* (.00)		Tenure	-.29** (.08)	-.00** (.00)
	P	-.05 (.13)	-.05 (.12)		P	-.07 (.15)	-.05 (.11)
	Q	.38** (.10)	.34** (.08)		Q	.32* (.16)	.25 (.13)
	PQ	-.39 (.20)	-.23 (.13)		PQ	-.15 (.36)	.06 (.09)
	P^2	.24 (.15)	.14 (.09)		P^2	.12 (.20)	-.07 (.18)
	Q^2	.05 (.13)	.03 (.08)		Q^2	.04 (.28)	.02 (.14)
SR Exceeded Productivity	Constant	2.09** (.17)	2.08** (.09)	SR Exceeded Quality	Constant	2.72** (.23)	2.38** (.09)
	P	-.04 (.13)	-.04 (.14)		P	-.15 (.12)	-.15 (.11)
	Q	.29* (.13)	.32* (.15)		Q	.32* (.15)	.31* (.16)
	PQ	-.31 (.18)	-.22 (.13)		PQ	.11 (.17)	.07 (.11)
	P^2	.34* (.16)	.24* (.11)		P^2	.17 (.11)	.11 (.07)
	Q^2	-.09 (.15)	-.06 (.10)		Q^2	-.06 (.19)	-.04 (.12)
OR Productivity	Constant	-.49** (.18)	-1174.55 (604.97)	OR Quality	Constant	4.06** (.70)	82.58** (5.75)
	P	-.02 (.13)	-41.79 (328.85)		P	-.13 (.14)	-2.93 (2.80)
	Q	.13 (.13)	356.79 (377.09)		Q	.47** (.09)	10.46** (1.77)
	PQ	-.25 (.34)	-436.71 (604.51)		PQ	.36 (.25)	5.23 (3.36)
	P^2	.02 (.19)	25.71 (328.87)		P^2	-.19 (.16)	-2.66 (2.36)
	Q^2	.15 (.23)	254.28 (406.66)		Q^2	-.39 (.24)	-5.73 (3.06)
OCB	Constant	4.02** (.37)	3.16** (.10)				
	Tenure	.20* (.08)	.00* (.00)				
	P	.05 (.09)	.04 (.08)				
	Q	.16 (.15)	.13 (.14)				
	PQ	.24 (.23)	.14 (.12)				
	P^2	-.02 (.20)	-.01 (.11)				
	Q^2	-.12 (.15)	-.07 (.09)				

Note. N ranges from 193 – 195. OR Outcomes were reported on vastly different scales than the other outcomes (Productivity ranges from -2,000 to 2,000; Quality ranges from 1-100). P = Productivity, Q = Quality, SR = Self-reported, OR = Organization-reported.
$^{**}p < .01$ $^{*}p < .05$.

Table 19
Response Surface Tests for Formal Systems for Productivity and Quality

Model	Surface Test	Coefficient	SE
Health	a_1	.15	.15
	a_2	.02	.15
	a_3	-.10	.15
	a_4	-.21	.15
Satisfaction	a_1	.54**	.11
	a_2	-.07	.17
	a_3	.18	.11
	a_4	.29	.17
Work Life Balance	a_1	.49*	.20
	a_2	-.06	.28
	a_3	.32	.20
	a_4	.20	.28
OR Safety	a_1	8.16*	3.20
	a_2	-3.42	4.87
	a_3	-12.64**	3.20
	a_4	-13.41**	4.87
SR Met Productivity	a_1	.29*	.14
	a_2	-.06	.17
	a_3	-.39**	.14
	a_4	.40*	.17
SR Met Quality	a_1	.20	.17
	a_2	.01	.24
	a_3	-.30	.17
	a_4	.15	.24
SR Exceeded Quality	a_1	.16	.19
	a_2	.14	.17
	a_3	-.46*	.19
	a_4	.01	.17
OR Quality	a_1	7.52*	3.31
	a_2	-3.17	5.12
	a_3	-13.39**	3.31
	a_4	-13.62**	5.12
Work Ability	a_1	.53	.28
	a_2	.03	.25
	a_3	-.69*	.28
	a_4	.46	.25

Note. $\mathbf{a}_1$ = slope along the line of agreement; ($\mathbf{b}_1 + \mathbf{b}_2$), where $\mathbf{b}_1$ is beta coefficient for productivity (P) and $\mathbf{b}_2$ is beta coefficient for quality (Q). $\mathbf{a}_2$ = curvature along the line of agreement; ($\mathbf{b}_3 + \mathbf{b}_4 + \mathbf{b}_5$), where $\mathbf{b}_3$ is beta coefficient for P squared, $\mathbf{b}_4$ is beta coefficient for the cross-product of P and Q, and $\mathbf{b}_5$ is beta coefficient for Q squared. $\mathbf{a}_3$ = slope along the line of disagreement; ($\mathbf{b}_1 - \mathbf{b}_2$), $\mathbf{a}_4$ = ($\mathbf{b}_3 - \mathbf{b}_4 + \mathbf{b}_5$), **SE =** standard error, **SR** = Self-reported, **OR =** Organization-reported.
$^{**}p < .01$ $^{*}p < .05$.

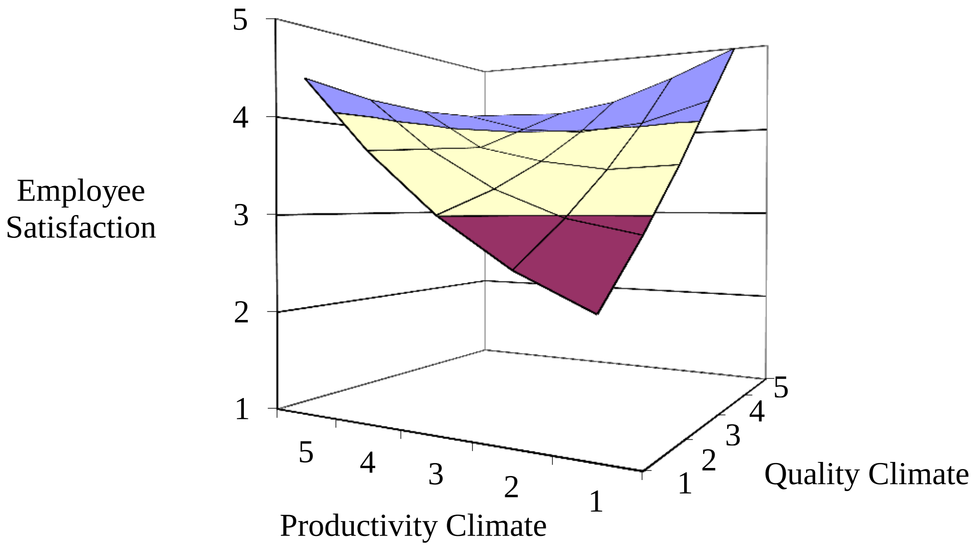

Figure 7. Employee Satisfaction as Predicted by the Discrepancy between Formal Systems for Productivity and Quality Climates

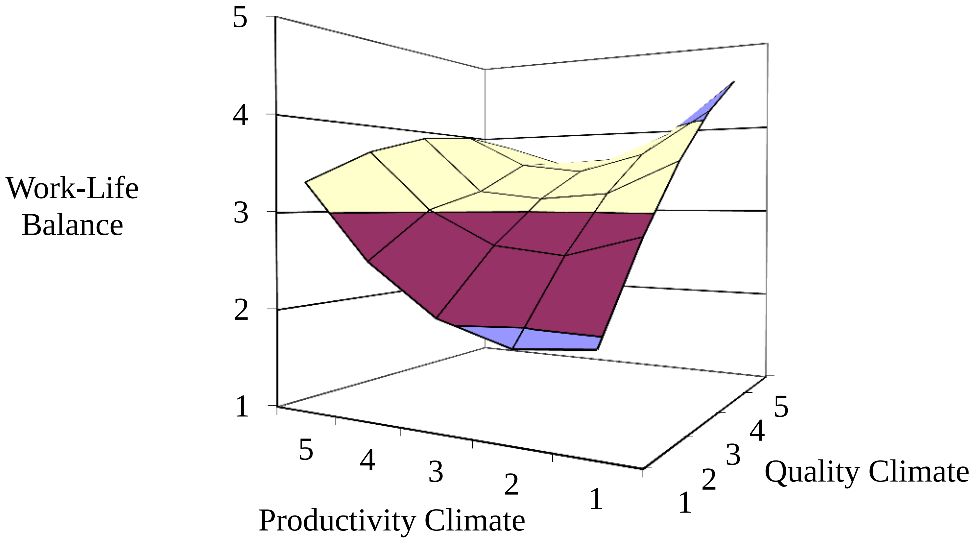

Figure 8. Employee Work-Life Balance as Predicted by the Discrepancy between Formal Systems for Productivity and Quality Climates

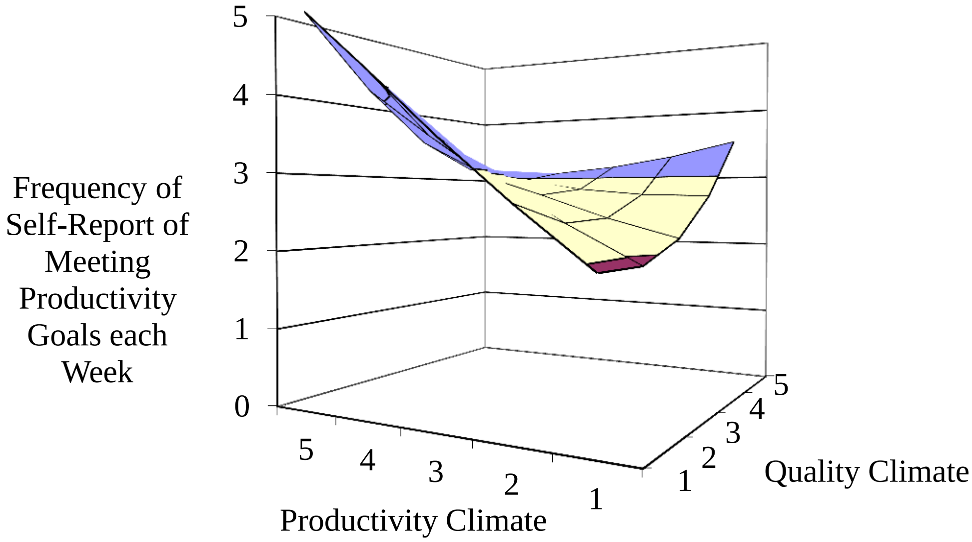

Figure 9. Frequency of Self-Report of Meeting Productivity Goals each Week as Predicted by the Discrepancy between Formal Systems for Productivity and Quality Climates

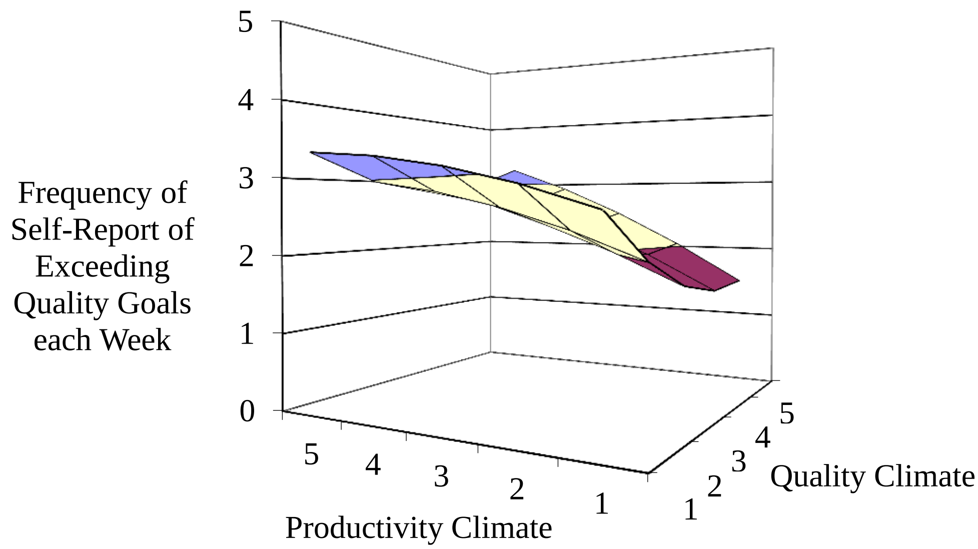

Figure 10. Frequency of Self-Report of Exceeding Quality Goals each Week as Predicted by the Discrepancy between Formal Systems for Productivity and Quality Climates

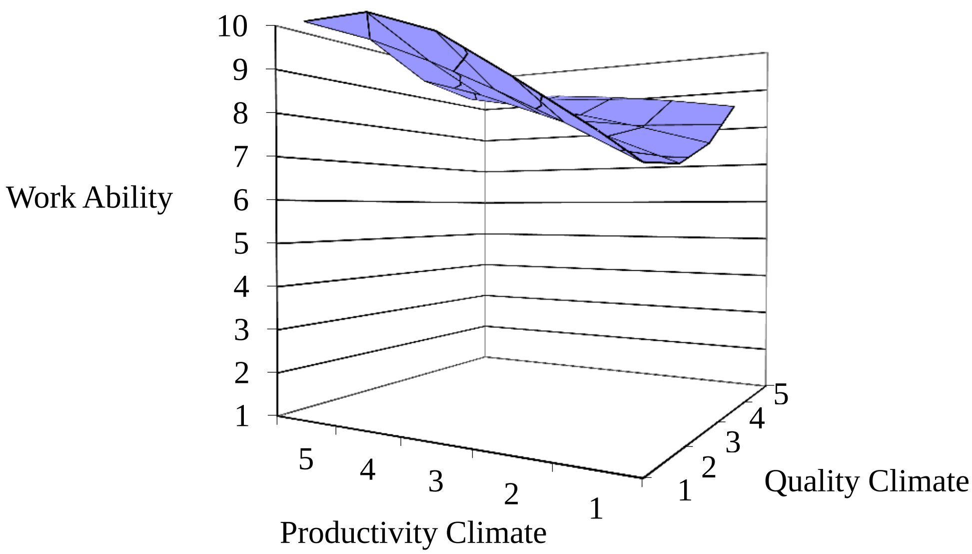

Figure 11. Work Ability as Predicted by the Discrepancy between Formal Systems for Productivity and Quality Climates

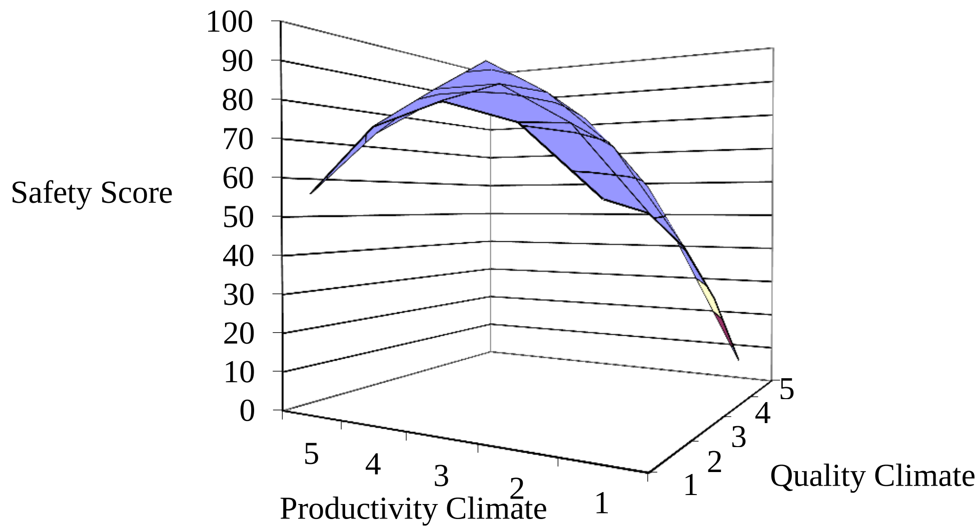

Figure 12. Safety Score as Predicted by the Discrepancy between Formal Systems for Productivity and Quality Climates

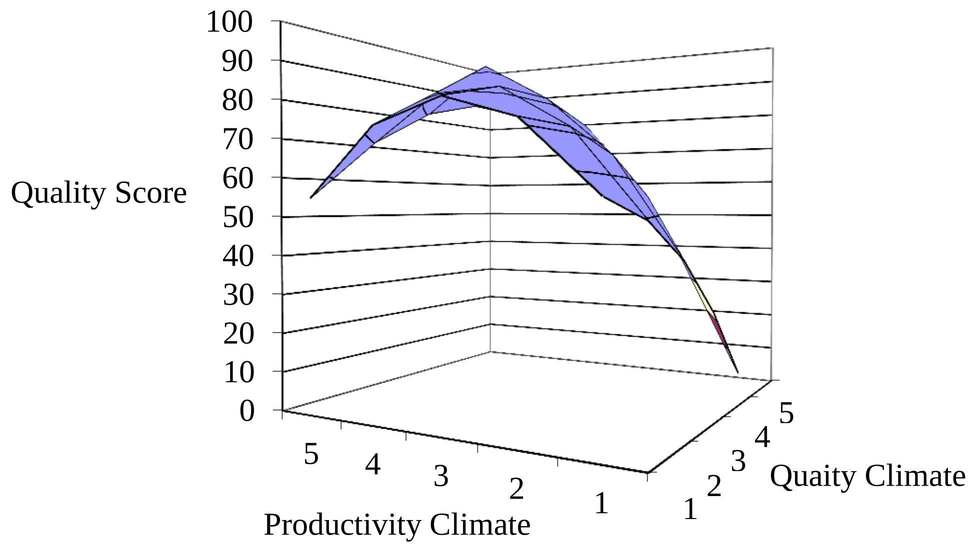

Figure 13. Quality Score as Predicted by the Discrepancy between Formal Systems for Productivity and Quality Climates

Table 20
Polynomial Regression Results for Management and Employee Involvement in Safety and Quality with Individual Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
Health	Constant	5.39** (.30)	4.37** (.26)	Satisfaction	Constant	3.90** (.31)	3.39** (.17)
	Age	-.32** (.06)	-.24** (.05)		Age	-.16* (.07)	-.13* (.06)
	S	-.16 (.20)	-.21 (.28)		S	-.14 (.17)	-.20 (.26)
	Q	.12 (.15)	.15 (.19)		Q	.40** (.15)	.54* (.23)
	SQ	.51* (.21)	.30* (.13)		SQ	.28 (.27)	.17 (.17)
	S^2	-.25 (.24)	-.14 (.13)		S^2	.08 (.28)	.05 (.17)
	Q^2	-.14 (.22)	-.08 (.13)		Q^2	-.26 (.21)	-.16 (.14)
Work Life Balance	Constant	2.31** (.39)	2.67** (.20)	SR Injury	Constant	.06 (.23)	.04 (.14)
	S	.12 (.14)	.22 (.29)		S	.04 (.26)	.04 (.28)
	Q	.41** (.10)	.73** (.21)		Q	.28* (.12)	.27 (.10)
	SQ	-.14 (.19)	-.12 (.15)		SQ	-.60** (.21)	-.27 (.10)
	S^2	-.16 (.19)	-.13 (.16)		S^2	.15 (.26)	.06 (.11)
	Q^2	.04 (.17)	.04 (.14)		Q^2	.15 (.14)	.07 (.07)
OR Safety	Constant	4.21** (1.30)	82.22** (9.60)	SR Near Misses	Constant	.75** (.26)	.58** (.22)
	S	.10 (.20)	3.18 (6.87)		S	.16 (.15)	.20 (.18)
	Q	.13 (.18)	3.97 (5.98)		Q	-.48** (.12)	-.56** (.18)
	SQ	.18 (.28)	2.55 (3.89)		SQ	.25 (.28)	.13 (.16)
	S^2	-.15 (.25)	-2.09 (3.46)		S^2	-.31 (.18)	-.16 (.10)
	Q^2	-.23 (.24)	-3.12 (3.59)		Q^2	.28 (.16)	.15 (.09)
Work Ability	Constant	5.83** (1.74)	7.54** (.67)				
	Tenure	-.18* (.07)	-.00** (.00)				
	S	.19 (.37)	.40 (.87)				
	Q	.25 (.32)	.49 (.68)				
	SQ	-.15 (.26)	-.14 (.24)				
	S^2	-.03 (.41)	-.03 (.37)				
	Q^2	.14 (.27)	.12 (.24)				

Note. N ranges from 190 – 200. OR Outcomes were reported on vastly different scales than the other outcomes (Safety scores range from 1-100). S = Safety, Q = Quality, SR = Self-reported, OR = Organization-reported.
$^{**}p < .01$ $^{*}p < .05$.

Table 21
Polynomial Regression Results for Management and Employee Involvement in Safety and Quality with Organizational Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
SR Met Productivity	Constant	3.44** (.56)	2.75** (.26)	SR Met Quality	Constant	3.85** (.39)	3.35** (.15)
	Tenure	-.18** (.07)	-.00** (.00)		Tenure	-.23** (.06)	-.00** (.00)
	S	-.02 (.13)	-.03 (.17)		S	.03 (.14)	.04 (.21)
	Q	.17 (.26)	.21 (.33)		Q	-.36** (.06)	-.48** (.10)
	SQ	.07 (.33)	.04 (.18)		SQ	.83** (.22)	.51** (.14)
	S^2	-.03 (.20)	-.02 (.11)		S^2	-.34 (.20)	-.20 (.11)
	Q^2	-.05 (.19)	-.03 (.11)		Q^2	-.02 (.17)	-.02 (.10)
SR Exceeded Productivity	Constant	2.16** (.26)	2.16** (.36)	SR Exceeded Quality	Constant	2.29** (.39)	2.28** (.19)
	S	.05 (.15)	.09 (.24)		S	.34* (.15)	.56 (.30)
	Q	-.05 (.29)	-.08 (.45)		Q	-.30 (.09)	-.46** (.14)
	SQ	.13 (.31)	-.15 (.17)		SQ	.27 (.27)	.19 (.19)
	S^2	-.22 (.24)	.09 (.22)		S^2	-.43* (.18)	-.30* (.15)
	Q^2	.21 (.25)	.15 (.18)		Q^2	.37* (.17)	.26* (.13)
OR Productivity	Constant	-.45 (.25)	-115.27 (716.65)	OR Quality	Constant	4.06** (1.16)	80.30** (9.48)
	S	.22 (.14)	906.48 (645.61)		S	.14 (.21)	4.44 (7.34)
	Q	-.20* (.09)	-761.12 (435.56)		Q	.10 (.19)	3.07 (6.01)
	SQ	.03 (.28)	46.81 (497.14)		SQ	.12 (.27)	1.62 (3.86)
	S^2	-.20 (.23)	-346.96 (416.99)		S^2	-.17 (.26)	-2.34 (3.76)
	Q^2	.15 (.20)	264.17 (353.38)		Q^2	-.16 (.25)	-2.21 (3.63)
OCB	Constant	2.45** (.79)	2.62** (.24)				
	S	.14* (.07)	.00** (.00)				
	Q	.38** (.06)	.67** (.22)				
	SQ	.24 (.13)	.39 (.30)				
	S^2	-.36* (.17)	-.27 (.17)				
	Q^2	-.22 (.10)	-.17 (.08)				
	P^2	.15 (.17)	.12 (.12)				

Note. N ranges from 198 – 200. OR Outcomes were reported on vastly different scales than the other outcomes (Productivity ranges from -2,000 to 2,000; Quality ranges from 1-100). S = Safety, Q = Quality, SR = Self-reported, OR = Organization-reported.
**$p < .01$ *$p < .05$.

Table 22
Response Surface Tests for Management and Employee Involvement in Safety and Quality

Model	Surface Test	Coefficient	SE
Health	a_1	-.07	.40
	a_2	.07	.22
	a_3	-.36	.40
	a_4	-.52*	.22
Work Life Balance	a_1	.95**	.35
	a_2	-.21	.26
	a_3	-.51	.35
	a_4	.02	.93
SR Met Quality	a_1	-.44	.23
	a_2	.29	1.39
	a_3	.52*	.23
	a_4	-.73	1.39
SR Exceeded Quality	a_1	.11	.33
	a_2	.15	.27
	a_3	1.02**	.33
	a_4	-.23	.27
SR Near Misses	a_1	-.36	.26
	a_2	.13	.21
	a_3	.76**	.26
	a_4	-.14	.21
OCB	a_1	1.06**	.37
	a_2	-.32	.23
	a_3	.27	.37
	a_4	.23	.23

Note. $\mathbf{a}_1$ = slope along the line of agreement; ($\mathbf{b}_1$ + $\mathbf{b}_2$), where $\mathbf{b}_1$ is beta coefficient for safety (S) and $\mathbf{b}_2$ is beta coefficient for quality (Q). $\mathbf{a}_2$ = curvature along the line of agreement; ($\mathbf{b}_3$ + $\mathbf{b}_4$ + $\mathbf{b}_5$), where $\mathbf{b}_3$ is beta coefficient for S squared, $\mathbf{b}_4$ is beta coefficient for the cross-product of S and Q, and $\mathbf{b}_5$ is beta coefficient for Q squared. $\mathbf{a}_3$ = slope along the line of disagreement; ($\mathbf{b}_1$ - $\mathbf{b}_2$), $\mathbf{a}_4$ = ($\mathbf{b}_3$ - $\mathbf{b}_4$ + $\mathbf{b}_5$), **SE =** standard error, **SR** = Self-reported, **OR =** Organization-reported.
$^{**}p < .01$ $^{*}p < .05$.

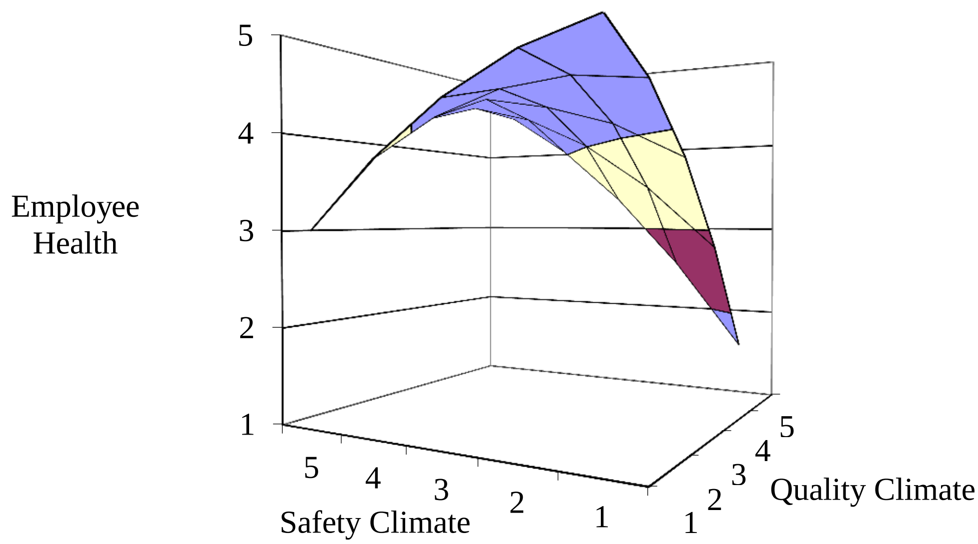

Figure 14. Employee Health as Predicted by the Discrepancy between Management and Employee Involvement in Safety and Quality Climates

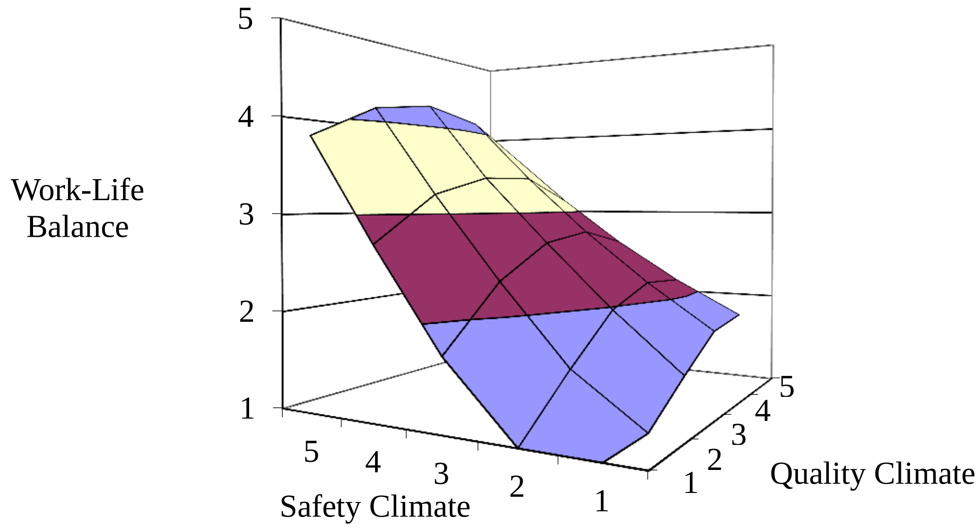

Figure 15. Employee Work-Life Balance as Predicted by the Discrepancy between Management and Employee Involvement in Safety and Quality Climates

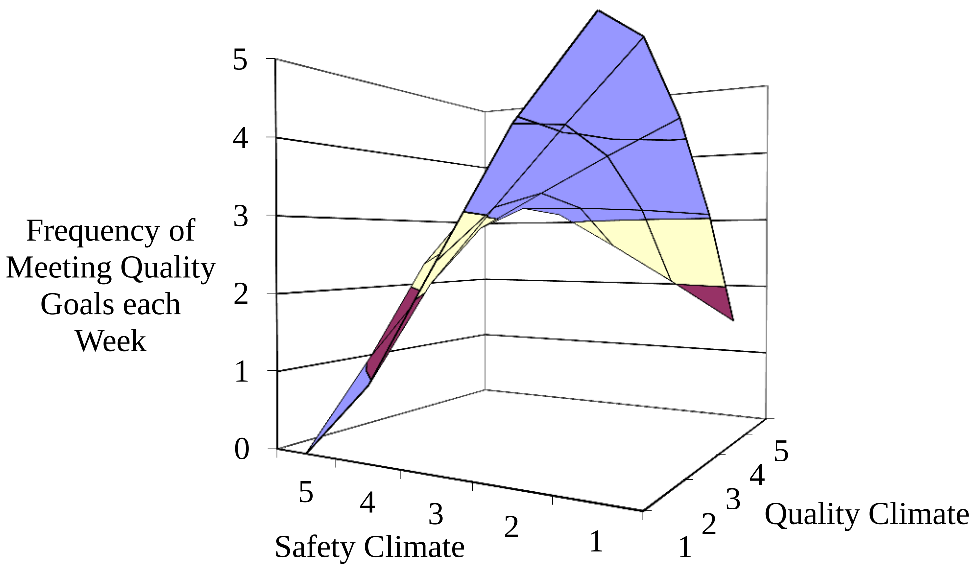

Figure 16. Frequency of Self-Report of Meeting Quality Goals each Week as Predicted by the Discrepancy between Management and Employee Involvement in Safety and Quality Climates

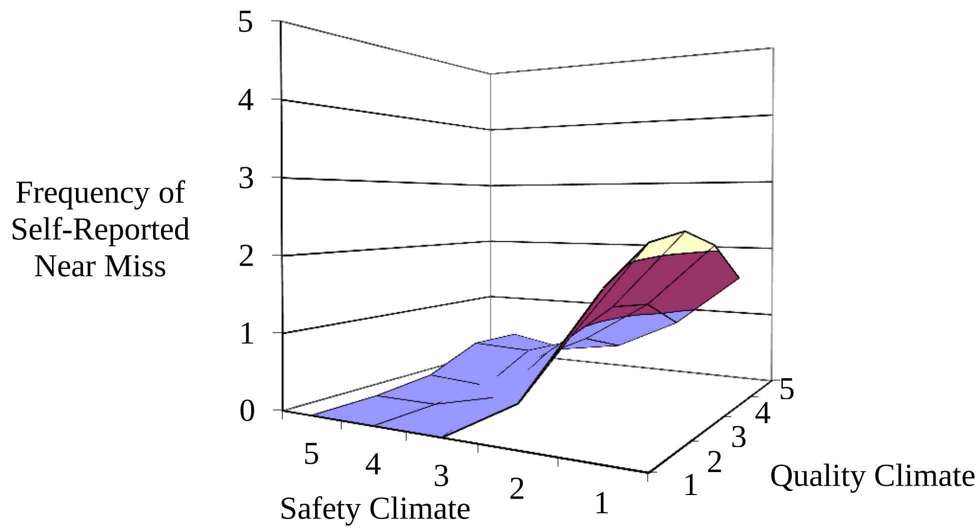

Figure 17. Frequency of Self-Reported Near Miss as Predicted by the Discrepancy between Management and Employee Involvement in Safety and Quality Climates

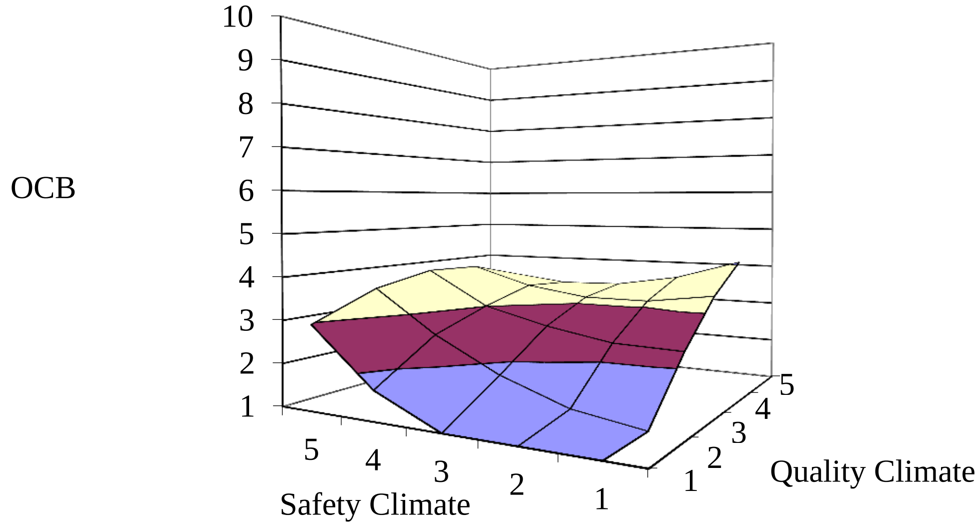

Figure 18. Organizational Citizenship Behaviors as Predicted by the Discrepancy between Management and Employee Involvement in Safety and Quality Climates

Table 23
Polynomial Regression Results for Formal Systems for Safety and Quality with Individual Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
Health	Constant	5.38** (.33)	4.40** (.25)	Satisfaction	Constant	3.62** (.57)	3.50** (.31)
	Age	-.33** (.06)	-.25** (.05)		Age	-.15** (.06)	-.14* (.05)
	S	-.18 (.26)	-.24 (.35)		S	.08 (.37)	.13 (.60)
	Q	.23 (.19)	.21 (.18)		Q	.49** (.18)	.54** (.19)
	SQ	-.11 (.33)	-.06 (.19)		SQ	-.28 (.29)	-.19 (.19)
	S^2	.10 (.35)	.06 (.19)		S^2	.08 (.42)	.05 (.28)
	Q^2	.07 (.13)	.04 (.07)		Q^2	.04 (.09)	.03 (.06)
Work Life Balance	Constant	2.46** (.41)	2.90** (.20)	SR Injury	Constant	.34** (.12)	.27* (.11)
	S	.35** (.13)	.65* (.30)		S	-.33* (.15)	-.42 (.28)
	Q	.17 (.15)	.22 (.20)		Q	.60** (.11)	.54* (.22)
	SQ	.09 (.25)	.07 (.20)		SQ	-.87** (.14)	-.47* (.19)
	S^2	-.40* (.17)	-.32* (.16)		S^2	.41* (.21)	.22 (.15)
	Q^2	.06 (.11)	.05 (.10)		Q^2	.24* (.11)	.13 (.08)
OR Safety	Constant	3.74** (1.22)	82.97** (10.01)	SR Near Misses	Constant	.77** (.20)	.52** (.12)
	S	.01 (.28)	.49 (10.04)		S	-.30 (.17)	-.32 (.20)
	Q	.47** (.11)	11.74** (3.56)		Q	.19 (.22)	.15 (.18)
	SQ	-.19 (.17)	-2.94 (2.90)		SQ	-.43 (.32)	-.20 (.16)
	S^2	-.01 (.25)	-.15 (3.86)		S^2	.17 (.22)	.08 (.11)
	Q^2	-.14 (.16)	-2.30 (2.39)		Q^2	.29 (.16)	.14 (.09)
Work Ability	Constant	6.46** (.72)	8.09** (.24)				
	Tenure	-.17** (.06)	-.00** (.00)				
	S	.09 (.17)	.18 (.35)				
	Q	.27 (.19)	.38 (.27)				
	SQ	.02 (.29)	.02 (.24)				
	S^2	.04 (.23)	.03 (.20)				
	Q^2	-.02 (.12)	-.02 (.11)				

Note. N ranges from 190 – 199. OR Outcomes were reported on vastly different scales than the other outcomes (Safety scores range from 1-100). S = Safety, Q = Quality, SR = Self-reported, OR = Organization-reported.
$^{**}p < .01$ $^{*}p < .05$.

Table 24

Polynomial Regression Results for Formal Systems for Safety and Quality with Organizational Outcomes

Outcome	Predictor	β (SE)	B (SE)	Outcome	Predictor	β (SE)	B (SE)
SR Met Productivity	Constant	3.68** (.46)	3.09** (.12)	SR Met Quality	Constant	4.00** (.50)	3.30** (.13)
	Tenure	-.14* (.06)	-.00* (.00)		Tenure	-.23** (.08)	-.00** (.00)
	S	-.35* (.16)	-.47 (.24)		S	-.11 (.20)	-.14 (.26)
	Q	.34* (.14)	.33* (.15)		Q	-.22 (.15)	-.21 (.15)
	SQ	.10 (.22)	.06 (.12)		SQ	.63** (.24)	.35* (.16)
	S^2	.24 (.20)	.14 (.13)		S^2	.04 (.22)	.03 (.13)
	Q^2	-.20* (.09)	-.12* (.05)		Q^2	-.16 (.12)	-.10 (.07)
SR Exceeded Productivity	Constant	2.09** (.33)	2.64** (.16)	SR Exceeded Quality	Constant	2.68** (.19)	2.46** (.21)
	S	-.53** (.11)	-1.08** (.37)		S	-.06 (.27)	-.09 (.41)
	Q	.50** (.14)	.72* (.30)		Q	-.04 (.17)	-.05 (.18)
	SQ	-.32 (.19)	-.28 (.20)		SQ	.38 (.25)	.24 (.16)
	S^2	.54** (.14)	.46* (.19)		S^2	.06 (.31)	.04 (.19)
	Q^2	-.09 (.10)	-.08 (.09)		Q^2	-.00 (.13)	-.00 (.08)
OR Productivity	Constant	-.11 (.16)	-288.92 (424.80)	OR Quality	Constant	3.81** (1.10)	82.10** (10.16)
	S	-.39** (.15)	-1650.08 (1034.58)		S	-.03 (.30)	-1.09 (10.39)
	Q	.26 (.23)	776.72 (781.81)		Q	.45** (.11)	10.97** (3.45)
	SQ	-.14 (.27)	-242.15 (517.12)		SQ	-.16 (.17)	-2.31 (2.64)
	S^2	.33 (.24)	585.40 (539.92)		S^2	.03 (.27)	.43 (3.99)
	Q^2	-.04 (.78)	-76.72 (269.52)		Q^2	-.17 (.16)	-2.62 (2.33)
OCB	Constant	3.21** (.65)	3.05** (.11)				
	Tenure	.15* (.07)	.00* (.00)				
	S	.03 (.15)	.04 (.23)				
	Q	.50** (.10)	.54** (.18)				
	SQ	-.48** (.16)	-.31** (.11)				
	S^2	.03 (.20)	.02 (.13)				
	Q^2	.19 (.15)	.13 (.09)				

Note. N ranges from 197 – 199. OR Outcomes were reported on vastly different scales than the other outcomes (Productivity ranges from -2,000 to 2,000; Quality ranges from 1-100). S = Safety, Q = Quality, SR = Self-reported, OR = Organization-reported.

**$p < .01$ *$p < .05$.

Table 25
Response Surface Tests for Formal Systems for Safety and Quality

Model	Surface Test	Coefficient	SE
Satisfaction	a_1	.66	.62
	a_2	-.11	.34
	a_3	-.41	.62
	a_4	.26	.34
Work Life Balance	a_1	.87*	.36
	a_2	-.20	.27
	a_3	.44	.36
	a_4	-.35	.27
SR Exceeded Productivity	a_1	-.36	.48
	a_2	.10	.29
	a_3	-1.80**	.48
	a_4	.65*	.29
SR Met Quality	a_1	-.35	.30
	a_2	.28	.21
	a_3	.07	.30
	a_4	-.43*	.21
SR Exceeded Quality	a_1	-.14	.15
	a_2	.27	.20
	a_3	.09	.16
	a_4	-.31	.20
SR Injury	a_1	.12	.36
	a_2	-.12	.25
	a_3	-.96**	.36
	a_4	.82**	.25
OR Safety	a_1	12.22	10.65
	a_2	-5.39	5.39
	a_3	-11.25	10.65
	a_4	.49	5.39
OCB	a_1	.58	.29
	a_2	-.17	.19
	a_3	-.50	.29
	a_4	.45*	.19

Note. $\mathbf{a}_1$ = slope along the line of agreement; ($\mathbf{b}_1 + \mathbf{b}_2$), where $\mathbf{b}_1$ is beta coefficient for safety (S) and $\mathbf{b}_2$ is beta coefficient for quality (Q). $\mathbf{a}_2$ = curvature along the line of agreement; ($\mathbf{b}_3 + \mathbf{b}_4 + \mathbf{b}_5$), where $\mathbf{b}_3$ is beta coefficient for S squared, $\mathbf{b}_4$ is beta coefficient for the cross-product of S and Q, and $\mathbf{b}_5$ is beta coefficient for Q squared. $\mathbf{a}_3$ = slope along the line of disagreement; ($\mathbf{b}_1 - \mathbf{b}_2$), $\mathbf{a}_4$ = ($\mathbf{b}_3 - \mathbf{b}_4 + \mathbf{b}_5$), **SE =** standard error, **SR** = Self-reported, **OR =** Organization-reported.
**$p < .01$ *$p < .05$.

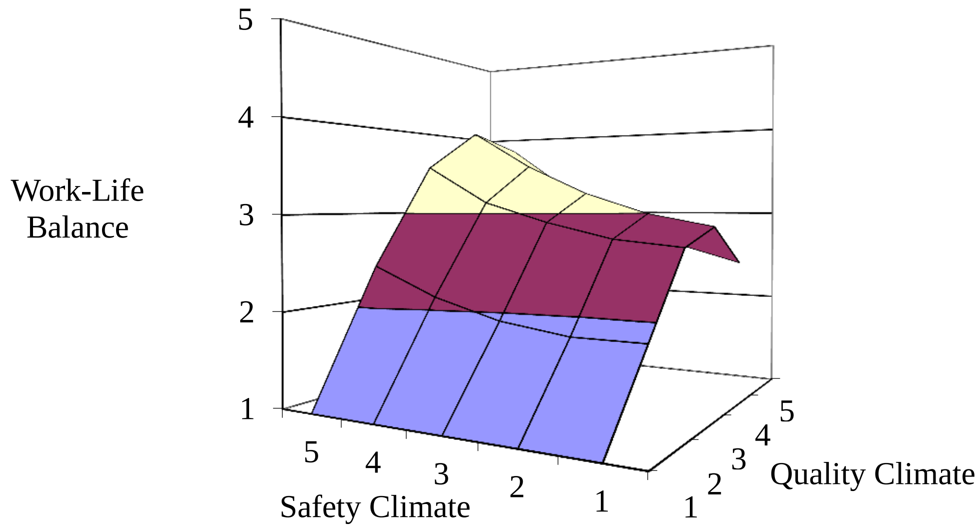

Figure 19. Employee Work-Life Balance as Predicted by the Discrepancy between Formal Systems for Safety and Quality Climates

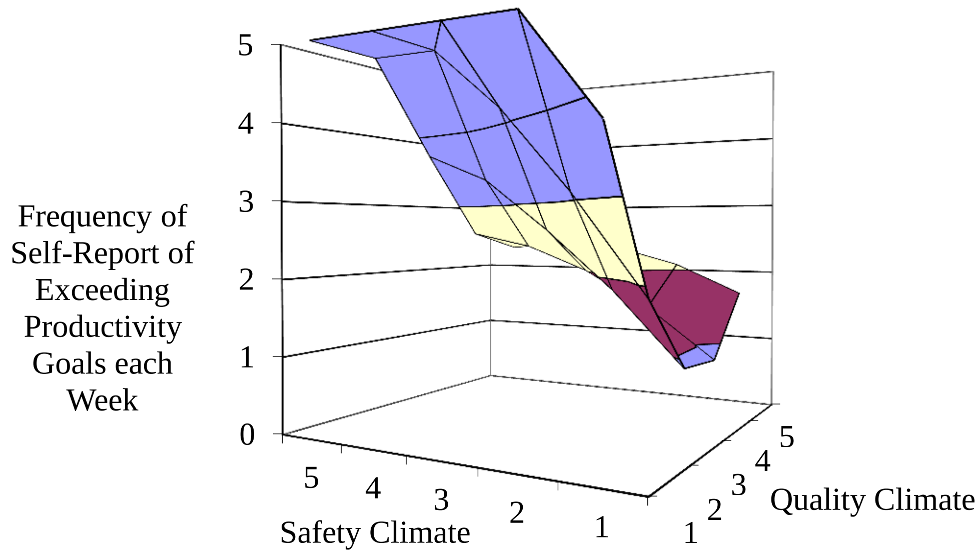

Figure 20. Frequency of Self-Report of Exceeding Productivity Goals each Week as Predicted by the Discrepancy between Formal Systems for Safety and Quality Climates

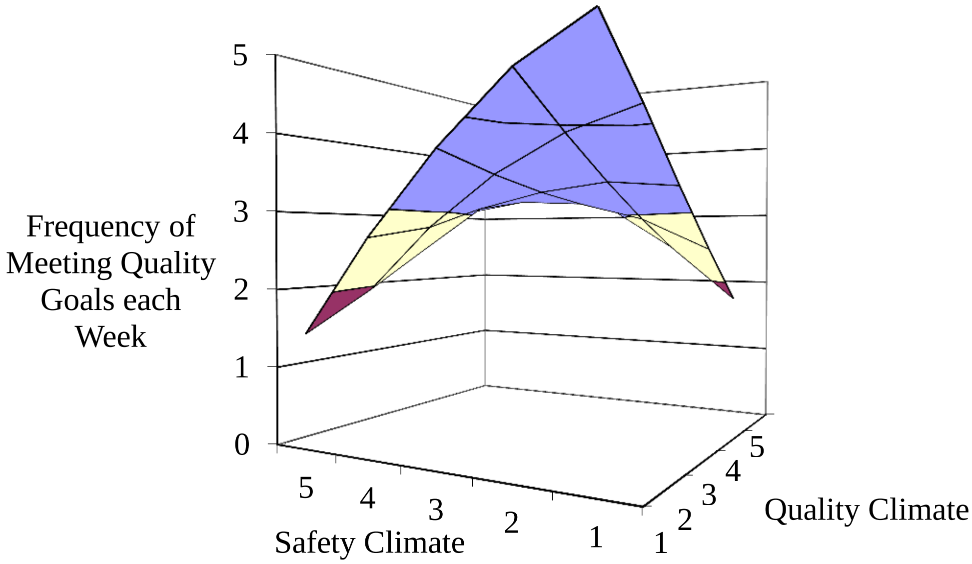

Figure 21. Frequency of Self-Report of Meeting Quality Goals each Week as Predicted by the Discrepancy between Formal Systems for Safety and Quality Climates

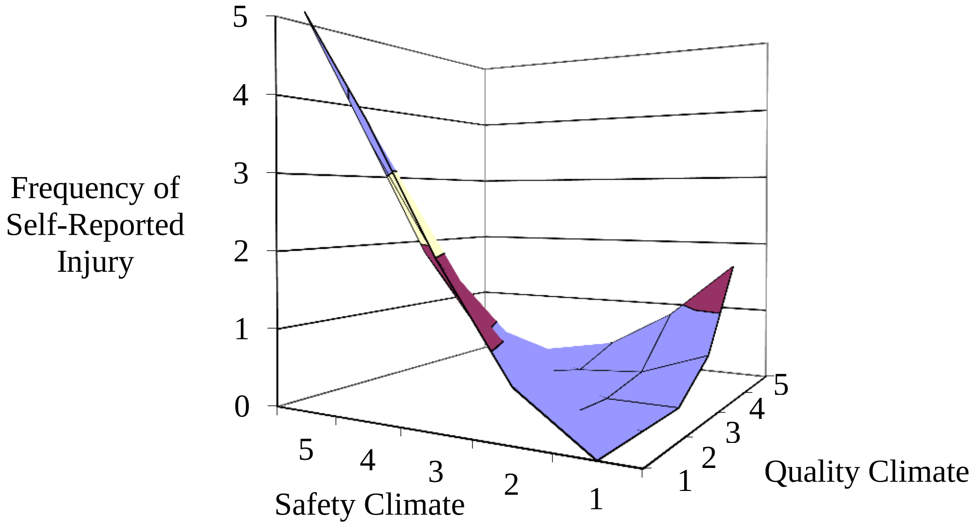

Figure 22. Frequency of Self-Reported Injury as Predicted by the Discrepancy between Safety and Quality Climates

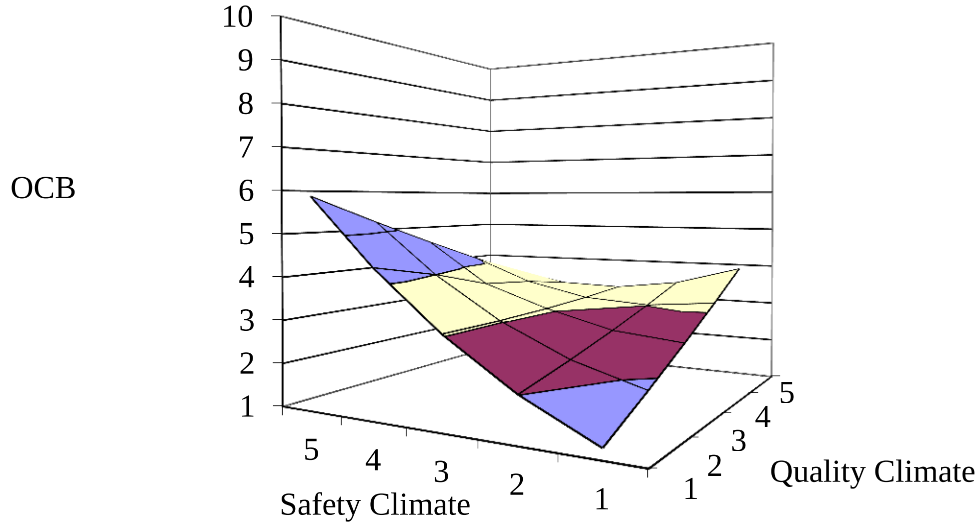

Figure 23. Organizational Citizenship Behaviors as Predicted by the Discrepancy between Formal Systems for Safety and Quality Climates

Table 26
Linear Regression Results for Leadership as a Predictor of Climate, Individual, and Organizational Outcomes

Outcome	β (SE)	B (SE)
Climate Variables		
Safety Climate ME	.38** (.06)	.26** (.04)
Safety Climate FS	.31** (.07)	.14** (.03)
Productivity Climate ME[ab]	.26** (.08)	.13** (.04)
Productivity Climate FS[ab]	.37** (.08)	.19** (.04)
Quality Climate ME[b]	.31** (.08)	.22** (.06)
Quality Climate FS[b]	.24* (.10)	.12* (.05)
Individual Outcomes		
Health[a]	.12 (.08)	.12 (.08)
Job Satisfaction[a]	.37** (.07)	.39** (.08)
Work-Life Balance	.33** (.07)	.41** (.09)
SR Injury	-.01 (.07)	-.00 (.05)
SR Near Miss	-.09 (.08)	-.07 (.06)
OR Safety	-.05 (.07)	-1.28 (1.64)
Work Ability[b]	.26** (.08)	.40** (.13)
Organizational Outcomes		
SR Met Productivity[b]	.21** (.06)	.20** (.06)
SR Exceeded Productivity	.11 (.07)	.13 (.08)
OR Productivity	.02 (.11)	58.44 (332.59)
SR Met Quality[b]	.16 (.10)	.14 (.09)
SR Exceeded Quality	.19* (.09)	.21* (.10)
OR Quality	-.05 (.07)	-1.28 (1.79)
OCB[b]	.16* (.07)	.15* (.06)

Note. N ranges from 162 – 202. ME = Management and employee involvement, FS = Formal systems, SR = Self-report, OR = Organization-report, OCB = Organizational citizenship behaviors. Only coefficients for Leadership are presented for each model.
[a]Age was included as a covariate in this model.
[b]Tenure was included as a covariate in this model.
[ab]Age and tenure were included as covariates in this model.
**p* < .05 ***p* < .01.

Table 27
Direct and Indirect Effects for Safety Climate Mediating the Effect of Leadership on Satisfaction

		Outcome	
Model	Predictor Variable	Safety Climate	Satisfaction
Management and Employee Involvement	Within Level		
	Direct Effects		
	Age	.06(.03)	-.15*(.07)
	Leadership	.37**(.07)	.39**(.09)
	ME Safety Climate		.14(.11)
	Indirect Effect via Safety Climate		
	Leadership		.05(.04)
	Between Level		
	Direct Effects		
	Age	.09(.39)	-.11(1.50)
	Leadership	-.08(.65)	.27(1.00)
	ME Safety Climate		-.36(2.67)
	Indirect Effect via Safety Climate		
	Leadership		.03(.10)
	ΔD from Null Model		1.63
Formal Systems	Within Level		
	Direct Effects		
	Age	.06(.05)	-.16**(.06)
	Leadership	.35**(.07)	.37**(.10)
	FS Safety Climate		.23(.14)
	Indirect Effect via Safety Climate		
	Leadership		.08(.05)
	Between Level		
	Direct Effects		
	Age	.01(.18)	-.10(.86)
	Leadership	-.17(.35)	.16(.89)
	FS Safety Climate		.13(.67)
	Indirect Effect via Safety Climate		
	Leadership		-.02(.13)
	ΔD from Null Model		1.82

Note. ME = Management and Employee Involvement, FS = Formal Systems, D = -2LogLikelihood.
*$p < .05$ **$p < .01$.

Table 28

Direct and Indirect Effects for Formal Systems for Safety Climate Mediating the Effect of Leadership on Work Ability

	Outcome	
Predictor Variable	Safety Climate	Work Ability
Within Level		
Direct Effects		
Tenure	.00*(.00)	-.01**(.00)
Leadership	.36**(.07)	.41**(.12)
FS Safety Climate		.26(.16)
Indirect Effect via Safety Climate		
Leadership		.09(.06)
Between Level		
Direct Effects		
Tenure	.00(.00)	-.00(.01)
Leadership	-.16(.31)	-.24(.39)
FS Safety Climate		.58(.70)
Indirect Effect via Safety Climate		
Leadership		-.10(.27)
ΔD from Null Model		1.67

Note. FS = Formal Systems, D = -2LogLikelihood.

**p* < .05 ***p* < .01.

Table 29
Direct and Indirect Effects for Formal Systems for Productivity Climate Mediating the Effect of Leadership on Work Ability

Predictor Variable	Outcome	
	Productivity Climate	Work Ability
Within Level		
Direct Effects		
Tenure	-.00**(.00)	-.00*(.00)
Leadership	.57**(.06)	.29*(.14)
FS Productivity Climate		.27**(.09)
Indirect Effect via Productivity Climate		
Leadership		.16**(.05)
Between Level		
Direct Effects		
Tenure	.01(.01)	-.00(.01)
Leadership	-.08(.48)	-.36(.57)
FS Productivity Climate		.37(.75)
Indirect Effect via Productivity Climate		
Leadership		-.03(.21)
ΔD from Null Model		7.97

Note. FS = Formal Systems, D = -2LogLikelihood.
*$p < .05$ **$p < .01$.

Table 30
Direct and Indirect Effects for Formal Systems for Productivity Climate Mediating the Effect of Leadership on Satisfaction

	Outcome	
Predictor Variable	Productivity Climate	Satisfaction
Within Level		
Direct Effects		
Age	-.19**(.07)	-.10(.06)
Leadership	.61**(.12)	.30*(.12)
FS Productivity Climate		.27**(.10)
Indirect Effect via Productivity Climate		
Leadership		.17**(.06)
Between Level		
Direct Effects		
Age	.34(.69)	-.16(1.75)
Leadership	-.29(2.29)	.06(3.30)
FS Productivity Climate		.85(2.86)
Indirect Effect via Productivity Climate		
Leadership		-.24(1.16)
ΔD from Null Model		.78

Note. FS = Formal Systems, D = -2LogLikelihood.
*$p < .05$ **$p < .01$.

Table 31
Direct and Indirect Effects for Formal Systems for Productivity Climate Mediating the Effect of Leadership on Work-Life Balance

	Outcome	
Predictor Variable	Productivity Climate	Work Life Balance
Within Level		
Direct Effects		
Leadership	.61**(.07)	.32**(.12)
FS Productivity Climate		.24*(.11)
Indirect Effect via Productivity Climate		
Leadership		.14(.07)
Between Level		
Direct Effects		
Leadership	-.00(.53)	-.41(.84)
FS Productivity Climate		-.78(1.43)
Indirect Effect via Productivity Climate		
Leadership		.00(.40)
ΔD from Null Model		.08

Note. FS = Formal Systems, D = -2LogLikelihood.
*$p < .05$ **$p < .01$.

Table 32
Direct and Indirect Effects for Management and Employee Involvement in Quality Climate Mediating the Effect of Leadership on Satisfaction

	Outcome	
Predictor Variable	Quality Climate	Satisfaction
Within Level		
Direct Effects		
Age	-.04(.03)	-.13(.39)
Leadership	.55*(.24)	.28(.60)
ME Quality Climate		.33(.60)
Indirect Effect via Quality Climate		
Leadership		.18(.26)
Between Level		
Direct Effects		
Age	-.17(.45)	.06(1.83)
Leadership	.17(2.49)	-.22(9.34)
ME Quality Climate		1.16(24.34)
Indirect Effect via Quality Climate		
Leadership		.20(7.00)
ΔD from Null Model		1.69

Note. ME = Management and Employee Involvement, D = -2LogLikelihood.
*$p < .05$ **$p < .01$.

Table 33
Direct and Indirect Effects for Management and Employee Involvement in Quality Climate Mediating the Effect of Leadership on Work-Life Balance

	Outcome	
Predictor Variable	Quality Climate	Work-Life Balance
Within Level		
Direct Effects		
Leadership	.55**(.05)	.25*(.10)
ME Quality Climate		.38**(.13)
Indirect Effect via Quality Climate		
Leadership		.21**(.07)
Between Level		
Direct Effects		
Leadership	.25(.27)	-.10(.52)
ME Quality Climate		-1.21(1.98)
Indirect Effect via Quality Climate		
Leadership		-.30(.67)
ΔD from Null Model		.14

Note. ME = Management and Employee Involvement, D = -2LogLikelihood.
*p < .05 **p < .01.

Table 34
Direct and Indirect Effects for Management and Employee Involvement in Quality Climate Mediating the Effect of Leadership on Work Ability

	Outcome	
Predictor Variable	Quality Climate	Work Ability
Within Level		
Direct Effects		
Tenure	.00(.00)	-.00**(.00)
Leadership	.55**(.04)	.12(.16)
ME Quality Climate		.59*(.23)
Indirect Effect via Quality Climate		
Leadership		.32(.13)
Between Level		
Direct Effects		
Tenure	-.00(.00)	.00(.01)
Leadership	.20(.32)	-.60(.57)
ME Quality Climate		.90(.79)
Indirect Effect via Quality Climate		
Leadership		.18(.26)
ΔD from Null Model		8.74

Note. ME = Management and Employee Involvement, D = -2LogLikelihood.
$*p < .05$ $**p < .01$.

Table 35
Direct and Indirect Effects for Formal Systems for Quality Climate Mediating the Effect of Leadership on Self-Reported Meeting Productivity Goals

	Outcome	
Predictor Variable	Productivity Climate	SR Meeting Productivity Goals
Within Level		
Direct Effects		
Tenure	-.00(.00)	-.00*(.00)
Leadership	.57**(07)	.12(.06)
FS Quality Climate		.13(.07)
Indirect Effect via Quality Climate		
Leadership		.07(.04)
Between Level		
Direct Effects		
Tenure	.00(.01)	.00(.01)
Leadership	-.15(.55)	.40(.38)
FS Quality Climate		.68**(.16)
Indirect Effect via Quality Climate		
Leadership		-.10(.36)
ΔD from Null Model		8.30

Note. SR = Self-Reported, FS = Formal Systems, D = -2LogLikelihood.
*$p < .05$ **$p < .01$.

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Appendix: Survey Items

Survey Items

Scale	Item prompt	Item	Response Options
Demographics	n/a	1. What is your age?	18-25 yrs, 26-35 yrs, 36-45 yrs, 46-55 yrs, 56-65 yrs, 65+ yrs
		2. How long have you worked at this company?	Years and months
		3. How long have you been working with your current, immediate supervisor?	Years and months
		4. What is the number of the jobsite you are currently working on?	Open-ended
		5. What is your trade?	Open-ended
		6. What is your level in the company?	Open-ended
Health	n/a	7. Overall would you say your health is…	1 (*excellent*) - 5 (*poor*)
Job satisfaction	n/a	8. How satisfied are you with your job in general?	1 (*highly dissatisfied*) – 5 (*highly satisfied*)
Work-Life Balance	n/a	9. Overall, I have a balance between my work and personal life.	1 (*strongly disagree*) – 5 (*strongly agree*)
Self-report productivity	n/a	10. How often in the past week have you met your productivity goal? 11. How often in the past week have you exceeded your productivity goal?	1 (*never*) – 5 (*very frequently*)
Self-report quality	n/a	12. How often in the past week has your work met quality expectations? 13. How often in the past week has your work exceeded quality expectations?	1 (*never*) – 5 (*very frequently*)

Survey Items Continued

Scale	Item prompt	Item	Response Options
Self-report accidents	n/a	14. How often in the past week have you experienced an accident or injury at work	1 (*never*) – 5 (*very frequently*)
Self-report near misses	n/a	15. How often in the past week have you experienced a near miss at work?	1 (*never*) – 5 (*very frequently*)
Work ability	For the following questions, please think about your work at RK Mechanical. Assume that your work ability at its best has a value of 10 points.	16. How many points would you give your current ability to work? 17. Thinking about the **physical** demands of your job, how do you rate your current ability to meet those demands? 18. Thinking about the **mental** demands of your job, how do you rate your current ability to meet those demands? 19. Thinking about the **interpersonal** demands of your job, how do you rate your current ability to meet those demands?	1 (*cannot currently work at all*) – 10 (*work ability at its lifetime best*)
Safety climate	**In this section, we'll ask you about your opinions on how SAFETY is valued in your company.**	20. My supervisor considers **safety** to be important. 21. There is NOT enough opportunity to discuss and deal with **safety** issues in meetings. 22. My supervisor places a strong emphasis on workplace **safety**. 23. Employees are regularly consulted about workplace **safety** issues. 24. There is open communication about **safety** issues within this workplace. 25. **Safety** is NOT given a high priority by my supervisor. 26. Employees are given the training they need to meet **safety** goals. 27. There are systematic procedures in place for improving **safety**. 28. Employees have sufficient access to workplace **safety** training programs. 29. The procedures and practices related to **safety** in this organization are useful and effective.	1 (*strongly disagree*) – 5 (*strongly agree*)

Survey Items Continued

Scale	Item prompt	Item	Response Options
Transformational Leadership	**In this section, we'll ask you about your supervisor and his or her behaviors.** How frequently does your current, immediate supervisor engage in the following behaviors?	30. Communicates a clear and positive vision of the future. 31. Treats staff as individuals, supports and encourages their development. 32. Gives encouragement and recognition to staff. 33. Fosters trust, involvement, and cooperation among team members. 34. Encourages innovative thinking about problems in new ways and questions assumptions. 35. Is clear about his/her values and practices what he/she preaches. 36. Instills pride and respect in others and inspires me by being highly competent.	1 (*never*) – 5 (*very frequently*)
Quality Climate	**In this section, we'll ask you about your opinions on how QUALITY is valued in your company.**	37. My supervisor considers **quality** to be important. 38. There is NOT enough opportunity to discuss and deal with **quality** issues in meetings. 39. My supervisor places a strong emphasis on **quality**. 40. Employees are regularly consulted about **quality** issues. 41. There is open communication about **quality** within this workplace. 42. **Quality** is NOT given a high priority by my supervisor. 43. Employees are given the training they need to meet **quality** goals. 44. There are systematic procedures in place for preventing **quality** issues. 45. Employees have sufficient access to **quality** training programs. 46. The procedures and practices related to **quality** in this organization are useful and effective.	1 (*never*) – 5 (*very frequently*)

Survey Items Continued

Scale	Item prompt	Item	Response Options
Productivity Climate	**In this section, we'll ask you about your opinions on how PRODUCTIVITY is valued in your company.**	47. My supervisor considers **productivity** to be important. 48. There is NOT sufficient opportunity to discuss and deal with **productivity** delays in meetings. 49. My supervisor places a strong emphasis on **productivity**. 50. Employees are regularly consulted about **productivity** delays. 51. There is open communication about **productivity** delays within this workplace. 52. **Productivity** is NOT given a high priority by my supervisor. 53. Employees are given the training they need to meet **productivity** goals. 54. There are systematic procedures in place for preventing delays in **productivity**. 55. Employees have sufficient access to training programs on how to be more **productive**. 56. The procedures and practices related to **productivity** in this organization are useful and effective.	1 (*strongly disagree*) – 5 (*strongly agree*)
Organizational Citizenship Behaviors	**These questions ask you about things you may do at work that aren't necessarily monitored by your company.** How often have you done each of the following things on your current jobsite?	57. Took time to advise, coach, or mentor a co-worker. 58. Helped a co-worker learn new skills or shared job knowledge. 59. Helped new employees get oriented to the job. 60. Lent a compassionate ear when someone had a work problem. 61. Lent a compassionate ear when someone had a personal problem.	1 (*never*) – 5 (*every day*)

Survey Items Continued

Scale	Item prompt	Item	
Organizational Citizenship Behaviors	**These questions ask you about things you may do at work that aren't necessarily monitored by your company.** How often have you done each of the following things on your current jobsite?	62. Changed vacation schedule, work days, or shifts to accommodate co-workers' needs. 63. Offered suggestions to improve how work is done. 64. Offered suggestions for improving the work environment. 65. Helped a co-worker who had too much to do. 66. Volunteered for extra work assignments. 67. Said good things about your employer in front of others. 68. Volunteered to help a co-worker deal with a difficult customer, vendor, or co-worker. 69. Went out of the way to give co-worker encouragement or express appreciation. 70. Defended a co-worker who was being 'put-down' or spoken ill of by other co-workers or supervisor. 71. Took time to advise, coach, or mentor a co-worker.	1 (*never*) – 5 (*every day*)