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Leadership alignment within a safety culture change process

Nicholas P. Krump

LEADERSHIP ALIGNMENT WITHIN A SAFETY

CULTURE CHANGE PROCESS

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A Research Project

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Nicholas P. Krump

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NICHOLAS P. KRUMP

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Date_____

Faculty Committee

_____
Committee Chair, Miriam Lacey, Ph. D.

_____
Committee Member, Kent Rhodes, Ph. D.

_____
Linda Livingstone, Ph. D., Dean
The George L. Graziadio School of Business
and Management

Abstract

     The purpose of this thesis was to determine the key components of effective leadership alignment within the safety culture change process at the National Cooperative Refinery Association in McPherson, Kansas. The implementation efforts provided data regarding leaders' actions, employee perceptions, and leadership alignment interventions. Research data gathered through 129 paper surveys and 25 group interviews were analyzed to identify relationships between work-related demographic indicators and workplace attitudes. The final analysis revealed a statistically significant relationship between the "alignment" composite and salaried employees, meaning salaried employees were more likely to answer positively than hourly employees. Secondly, the findings showed a strong association of "role of teams" where employees on grassroots safety culture teams and the guidance team were more positive than non-team members.

     The key components of leadership alignment were found to be leaders' actions, grassroots and guidance team structure, and leadership alignment dialogues. When leaders followed safety policies and procedures, were visible to employees, responded to safety concerns in a timely manner, and provided detailed safety information, alignment was created. The leadership alignment dialogues created alignment when leaders took the time to listen first to concerns and not just react, engaged in honest and candid dialogue, and apologized for making mistakes. The planned guidance and grassroots team structures and projects were recognized by employees as maintaining the National Cooperative Refinery Association's safety culture change efforts. In conclusion, the safety culture change process was successful, reducing the National Cooperative Refinery Association's incident and injury rates from 2008 to 2009. To continue to improve safety performance, it is recommended the association continue the team structure, complete leadership alignment dialogues with all supervisors, and target specific units for safety improvement.

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Chapter 1

Introduction

Within the safety culture change process, there is a need for leadership alignment to be established. Leadership alignment occurs when there is consensus for the safety culture implementation strategy at various levels within the organization from employee groups to supervision to upper management. Leaders must gather employee perceptions to identify true alignment, assumed alignment, forced alignment, or skewed alignment around the direction and implementation of the safety culture change process.

Often, when implementing change initiatives, actions begin with aligning the assumption leaders. Without establishing alignment, change efforts often fail, costing organizations money, time, and trust. In the safety culture change process, misalignment within the leadership levels manifests in incomplete safety culture projects, lack of employee trust, unwillingness on the part of supervisors to invest the time to understand the framework, and higher levels of resistance to new cultural norms. If leaders are misaligned, organizations struggle to continue the safety culture change process and miss the learning opportunities generated by each team's work, stunting much of the iterative safety culture change process.

Creating shared leadership within the safety culture change process through leadership alignment allows participation from all levels of employee groups. Participation from all levels of an organization is uncommon in traditional hierarchical organizations and provides a framework and language to confront power, establishing positive conflict built on trust and respect (Katzenbach &

Smith, 2003). The ability to challenge the underlying norms, assumptions, and policies within an organization determines the depth and longevity of the safety culture change process.

Flexible patterns of organization strengthen a system's ability to differentiate, integrate, and evolve, and leadership alignment allows organizations to deal with external factors in the environment such as safety that may impact an organization (Lund & Gjerding, 1996). World-class manufacturing organizations view safety as a strategic business priority in line with quality, production, and cost. Specifically, in the field of safety, the emerging business paradigm has expanded the spectrum of managing safety to include safety culture, a leading indicator of safety performance. Safety management from an organizational culture perspective moves beyond managing from an engineering, enforcement, and education perspective (Simon, 1999).

The field of safety culture emerged in the 1980s after several catastrophic and public disasters. By looking at the perceptions, norms, and assumptions within working groups, safety culture addresses the human elements of safety and moves safety management from the lagging edge to the leading edge of prevention. Safety culture work involves the entire organizational system to address and prevent employee risks. As a result, successful safety culture initiatives reduce employee incident and injury rates, reduce workers' compensation costs, and increase employee engagement and empowerment.

Study Purpose

This study determined the key components of effective leadership alignment within the safety culture change process. Specifically, it examined

leadership alignment within the implementation of safety culture change process at the National Cooperative Refinery Association (NCRA) in McPherson, Kansas. The safety culture change process at NCRA was led by Culture Change Consultants, Inc. It was one of NCRA's strategic priorities to be recognized as an Occupational Safety and Health Administration voluntary protection programs star site for safety performance (U.S. Department of Labor, Occupational Safety and Health Administration, n.d.). Researching the implementation efforts of NCRA's safety culture change process provided data regarding leader's actions, employee perceptions, and leadership alignment interventions.

Safety culture change initiatives are successful when leadership at all levels of the organization engage in creating an intentional safety culture. There is a need to determine the key components of leadership alignment within the safety culture change process to be more deliberate and knowledgeable about how leadership alignment impacts specific implementation components and the overall change effort within the safety culture change process. Determining the key components of leadership alignment within the process may allow for organization leaders to lower levels of resistance, increase employee engagement, decrease mistrust, and continue change efforts with sustainability in mind.

By involving the different employee groups, the data collected provided multiple perspectives for analysis. Including the different groups enabled assessment of how all groups are impacted by the level of leadership alignment established within the process. This information was valuable to leaders within the safety culture change process as they moved forward and continued to

improve their safety culture and performance. The results also helped to determine who was responsible for alignment, what actions create alignment, and what data leaders should gather to determine if alignment exists within the change initiative.

Research Setting

NCRA in McPherson, Kansas, began in 1943 when five farming cooperatives purchased the facility from Globe Oil, who built the facility in 1932 at a cost of $1 million. Today, the facility is owned by three member-owners: CHS Inc., Growmark, and MFA Oil Company (NCRA, 2009). The plant is a high-capacity operation processing 85,000 barrels of crude a day into gasoline, diesel, and propane. In addition to the production side of the business, the company manages more than 60 trucks in the distribution network and more than 1,000 miles of pipeline. The cooperative supplies refined fuels to farmers across the Midwest. With an employee base of 650, this organization produced a net income of $567 million in 2007 (76.1% return on equity) and $273 million (35% return on equity) in 2008.

NCRA's strategic location in the middle of the Great Plains and its connection to three pipelines that transport crude oil from Canada, the Rocky Mountains, and the Southern United States and marine terminals provide a market advantage. Additionally, the company is positioned close to underground storage facilities and salt caverns, in Conway, Kansas. This allows the company to control when it brings the product to market. In 2008, about 35% of the product was loaded onto trucks and shipped to terminals, while the remainder was sold directly as pipeline shipments. With the recent record profits, NCRA has begun

several capital improvement projects including the Heavy Crude Expansion Project, part of the clean fuels project slated for completion in 2010, which will allow the refinery to tap into the 435,000 barrels a day of Canadian heavy sour crude arriving in Cushing, Oklahoma (NCRA, 2009).

From a safety performance standpoint, over the past 3 years, the accident rate at the refinery has decreased and NCRA was recognized with the Refiners Association Gold Safety Award, along with the safety management award from its majority owner, CHS, Inc. The structures in place to manage safety at the refinery consist of a safety council of four people, the safety department, and a behavior-based safety program. This structure is responsible for the employee safety in 10 different areas across the facility including: OIP; MAP; Feed Unit; Clean Fuels, Unicracker, Hydrogen Units (ALKY Unit); CAT Unit; R&F Unit; Pumphouse, Truck Sales, Tank Farm, Conway Underground Storage (TCC); Boilerhouse; and Maintenance. However, with a rate of 3.2 total recordable incident and injury cases in 2008, NCRA's safety performance was below the petroleum refining industry average of 0.7 recordable injuries and illnesses per 100 full-time workers (Bureau of Labor Statistics, n.d.). Within the 3.2 total cases figure, there were 1.4 lost time incidents, 1.8 restricted day and lost time incidents, and 18.8 lost work days. From a safety management perspective, NCRA's safety performance had reached a plateau and did not include a safety culture component. To improve its safety performance and continue reducing safety incidents and accidents, the NCRA senior leadership, including both salary and union employees, chose to implement the safety culture change process facilitated by Culture Change Consultants, Inc.

In August 2008, NCRA began the safety culture change process with an Achieving World Class Safety workshop for employees. The workshop objectives included enlisting and educating leaders, understanding the basic concept of safety culture change, and creating buy-in for the process. In September 2008, the Culture Change Consultants, Inc. safety culture assessment was administered to 367 employees, followed by focus groups interviews with 20% of the respondents to produce the NCRA safety culture assessment report. The safety culture assessment report was fed back to 65 employees in November 2008 with the key findings, recommendations, and survey data. From the findings of the report, NCRA chose to move forward with creating a safety culture guidance team and safety culture grassroots teams as the structure responsible for facilitating the safety culture change process.

Crucial to the success of this project was a safety manager at NCRA and internal safety culture change champion who coordinated all activities on site. The safety culture guidance team formed in January 2009 and consisted of five salaried and four union employees, including the vice president of refining, director of human resources, operations manager, safety manager, MAP supervisor, the vice president of the union, and three veteran union members. In March 2009, two supervisor awareness workshops were held to allow supervisors and middle managers to learn about the safety culture change concepts and ask follow up questions. There was some push back from the middle managers about the commitment of senior level executives to stay the course with the safety culture change process, and supervisor interviews were held to clarify the supervisors' perspectives. In April 2009, four safety culture

grassroots teams were chartered by the guidance team to work on safety culture projects related to the findings in the November 2008 safety culture assessment report. In February 2010, the first of three leadership alignment dialogue sessions was held with 18 salaried employees, including the vice president of operations and the vice president of refining.

The specific setting for this research was the employee group at the NCRA. NCRA is in Year 2 of its safety culture change initiative and has completed several safety culture change interventions including: the Achieving World Class Safety Workshop, a Safety Culture assessment and report, a 2-day Safety Culture Report feedback session, a leadership team meeting, formation of a guidance team, two 1-day supervisor awareness sessions, supervisor focus groups, formation of four grassroots teams, and a guidance team and grassroots team health check. Additionally, NCRA has sent 76 employees to the Culture Change Consultants, Inc.'s 3-day workshop "Implementing Safety Culture Change through Grassroots Leadership." Starting in August 2008, NCRA made a significant effort to involve employee groups, build consensus among the union and management, and educate its employees about the safety culture initiative. NCRA was chosen for the research setting because the researcher has been involved from the initial workshops and was the lead consultant on the project. Additionally, the researcher has an excellent working relationship with Scott Swanson, the internal safety culture change project manager.

NCRA has a dedicated guidance team and grassroots team structure for implementing the safety culture change initiative. NCRA's four grassroots teams are made up of hourly employees along with one supervisor, whereas the

guidance team is comprised of four union and six salaried employees.

Additionally, NCRA has provided training to employees who were not on one of

the dedicated teams and sought supervisor perceptions through training,

dialogues, focus groups, and surveys. Data were collected from employees on a

dedicated safety culture team, employees participating in the process but not on

a team, and employees who have not participated in the process.

NCRA, located in McPherson, Kansas, has 610 employees and is the

major employer and economic engine within this small, rural, agricultural-

centered community of roughly 15,000 people. Not only is safety a priority for the

company, but also for the nearby McPherson community located less than two

miles from the refinery grounds. Data were collected from many groups because

of a previous working relationship with Culture Change Consultants, Inc.

Organization of the Study

Chapter 2 is a literature review of major concepts within the field of

leadership alignment and safety culture, including current research on leadership

alignment, defining safety culture, a model of safety culture, characteristics of a

safety culture, a comparison of culture-based safety versus behavior-based

safety, and the current leadership alignment practices within safety management.

Chapter 3 includes the research methods designed to gather sufficient

data to address key components of effective leadership alignment within a safety

culture change process. Phase 1 of the research includes a paper survey

designed to identify alignment at both salaried and hourly levels. Phase 2 of the

research gathers qualitative data through interviews and focus groups for both

salaried and hourly levels. Phase 3 identifies specific actions and structures within the safety culture change process creating alignment.

Chapter 4 provides the results of the data gathered to investigate effective leadership alignment at NCRA. Chapter 4 is comprised of a survey analysis and interview analysis section. Finally, chapter 5 provides a brief summary of the findings and draws conclusions. Chapter 5 also identifies the limitations of the research and offers suggestions for further research in safety culture. From the research and the data collected for NCRA, recommendations are suggested.

Chapter 2

Literature Review

This study aimed to determine the key components of effective leadership alignment interventions within the safety culture change process. The literature review presented in this chapter includes current research on leadership alignment and defining safety culture, including presenting a model of safety culture, characteristics of a safety culture, and a comparison of culture-based safety versus behavior-based safety. The current leadership alignment practices within safety management are discussed. Leadership alignment, in combination with organizational design and key actions among leaders, is necessary to create agreement and direction within organizations. As a new field of safety management, the emergence of a safety culture has generated many dimensions and insights into the definition, characteristics, and practices of a safety culture, while fueling a debate among scholars and practitioners. There is consensus that a safety culture impacts an organization's safety performance; however, there is little agreement regarding implementation strategies such as those concerning scope, sequence, and methods.

Leadership Alignment

Leadership alignment can be characterized as a double-loop learning process (Argyris, 1979), where organizations clarify assumptions and expectations. Leadership alignment processes move organizations to learn from predictable patterns instead of learning from failure cases. Also, leadership alignment can reveal an individual employee's defensive behavior, thus, enabling the leader to forecast possible areas of resistance during the implementation

stages of change processes. When organizations are proactive and work to create leadership alignment, employees' concerns are addressed, leaders' past behaviors are revealed, and the organization's predictable response to change is surfaced.

Addressing the emotions associated with leaders at all levels of the organization, Goleman, Boyatzis, and McKee (2002) did work on building emotionally intelligent organizations and highlighted three essential components: discovering the emotional reality, visualizing the ideal, and sustaining the emotional intelligence. Counter to the efficiency culture of most organizations in the United States, creating alignment within organizations requires the dedication of time to involve employees in dialogue and gather their perspectives. The amount of time spent creating this alignment is rarely seen as a value-added activity. Additionally, it generally does not produce tangible results at the accustomed speed of business.

It is uncertain how often organizations commit to such an intervention and how they measure the return on investment of the intervention. Most organizations look for leadership alignment around corporate strategy, vision, and goals. While this work is essential for a high-performance organization, it is often linear and rational, lacking the emotional aspect to create trust, respect, and commitment (Goleman et al., 2002). Questions arise regarding how trust, respect, and commitment can be created within organizations, while the progress of organizations hinges on their ability to deal with change and align leaders around strategic change efforts, rather than just around the mission, vision, and goals.

The principle of leadership alignment, both vertically and horizontally, goes beyond just senior management and is more nuanced than previously thought at the lower levels of management (Guth & Macmillan, 1986). O'Reilly, Caldwell, and Chatman (2005) studied the effectiveness of implementing a strategic initiative in a large health care system and examined the consistency of leadership effectiveness across hierarchical levels. This case provides one example of how to address the need for and effectiveness of leadership alignment. Their results showed when there was leadership alignment, meaning all levels of leadership were engaged in the strategic change efforts and there was consistency of leadership at different levels within the organization, a significant performance improvement followed. O'Reilly et al. concluded, "leaders at various levels should be considered collectively to understand how leadership influences strategic change" (p. 2). They further suggested that earlier researchers "neglected to consider the extent to which leaders at intermediate levels (e.g., department or division managers) were aligned in their support for the new strategy" (p. 6). The research by O'Reilly et al. provided positive evidence for aligning leaders across hierarchical levels to produce effective, lasting strategic change by measuring overall patient satisfaction over a 2-year period, suggesting that investing the organization's time and capital in such organizational development interventions produces many dividends.

Recently, Drath et al. (2008) proposed a new leadership framework and new leadership ontology—direction, alignment, and commitment (DAC)—focusing on these practical outcomes to determine if leadership is present within organizations. What was intriguing was the addition of alignment to this definition

of leadership. This new ontology transcended Bennis' definition of leadership and his tripod theory by suggesting, "the current, widely accepted leadership ontology—leadership, followers, and shared goals—is becoming less useful for understanding leadership in contexts that are increasingly peer-like and collaborative" (p. 635). The new framework moved the leadership dialogue forward by specifically focusing on new leadership beliefs and practices which create direction, alignment, and commitment. The new framework proposed by Drath et al. stated, "leadership is a necessary but not sufficient precondition for achieving the longer term purposes and goals of a collective" (p. 636), and DAC must be produced as a short-term criterion. It is the reproduction, development, and re-creation of DAC that contributes to the long-term outcomes, often the desired state at the onset of a strategic change effort.

The achievement of DAC within an organization allows for cooperation and shared work to occur successfully. How DAC is produced is based on beliefs and practices within the organization, encompassing some of the components of Schein's (2004) definition of organizational culture. Drath et al. (2008) argued it is an individual's beliefs, along with the collective beliefs about how to produce DAC, that construct the social practices within an organization. Bringing attention to these shared beliefs becomes the work of organization development professionals working within today's organizations.

By revealing the social practices and the beliefs within an organization, the organization's current state of DAC becomes useful data for implementing the future state. The data gathered through leadership alignment may determine areas of misalignment and raise questions such as: what messages are being

interpreted by employees, who is considered an informal leader, and how are committed employees implementing change? Leadership alignment interventions may create a 'tipping point' within an organization to catalyze culture change, suggesting that if employees perceive all levels of leaders working on alignment around the change strategy, then support will follow to fulfill the long-term organizational goals.

Given the current research on leadership theories and practices and, specifically, the new leadership framework proposed by Drath et al. (2008), an understanding of leadership alignment within the safety culture change process would be useful to organizational leaders. According to Drath et al., culture change is considered leadership if it works to achieve DAC as an outcome.

A small body of research connects the role of leadership to establishing a positive safety culture. Thompson, Hilton, and Witt (1998) determined that workers' safe behavior is influenced not only by how managers communicate about safety issues raised by workers but also by how fairly workers are treated by supervisors. In their article "Target Zero: A Culture of Safety," Burman and Evans (2008) cited a case study of the Bristow Group, a civil aviation company providing helicopter transportation to the oil and gas industry. Burman and Evans distinguished the difference between safety management and safety leadership. Recognizing the role of culture in the organization's safety performance, Burman and Evans emphasized the need to create a learning culture that connects all level of the organization involved in safety. In the Bristow Group example, this would mean aligning the pilots, maintenance crew, supervisors, and executive management around the goal of zero accidents. Most closely related to

leadership alignment within a safety culture change process is the research

Zohar and Luria (2003) conducted on supervisor-based safety.

Defining Safety Culture

In terms of safety management, much of the focus in the past 10 years

has been on safety culture. Several catastrophic accidents, including the

Chernobyl meltdown in the former Soviet Union and the United States' Space

Shuttle Columbia explosion, introduced the idea of safety culture to an expansive

audience and garnered attention to the field of safety culture. As a term, *safety*

culture first appeared and was defined in the pioneer study by the International

Atomic Energy Agency *Safety Culture: A report by the International Nuclear*

Safety Advisory Group (1991). The International Nuclear Safety Advisory Group's

1988 report explained how the events of the Chernobyl disaster were triggered

by a lack of knowledge and understanding of risk and safety by employees within

the organization (cited in International Atomic Energy Agency, 1991). According

to Choudhry, Fang, and Mohamed (2007), the report described safety culture as

characteristics and attitudes in organizations and individuals which establishes,

as an overriding priority, that nuclear plant safety issues receive the attention

warranted by their significance. Choudhry et al. argued this report left the

definition of safety culture open to interpretation, suggested no way of assessing

safety culture, and believed the definition was not developed theoretically within

organizational culture. Furthermore, the report made no direct link between

safety culture and safety performance or safety leadership.

Since the seminal work of the International Atomic Energy Agency in

1991, most safety professionals recognized safety culture as a valid concept;

however, the debate regarding what safety culture was continued (Guldenmund, 2000). The debate gained heat when the causes, content, and consequences were examined and continued without an accepted model within the safety field (Choudhry et al., 2007; Guldenmund, 2000). In October 2003, after another space shuttle explosion, the Columbia Accident Investigative Board, delivered information emphasizing how the behavior of the organization and its leadership doomed the shuttle. Citing a "broken safety culture," the Board stated:

> The investigation uncovered a troubling pattern in which Shuttle Program management made erroneous assumptions about the robustness of a system based on prior success rather than on dependable engineering data and rigorous testing. The Shuttle Program's complex structure erected barriers to effective communication and its safety culture no longer asks enough hard questions about risk. Safety culture refers to an organization's characteristics and attitudes—promoted by its leaders and internalized by its members—that serve to make safety the top priority. (2003, pp. 184-185)

Despite the technical expertise of NASA employees, their assumptions and perceptions regarding risk and safety, more simply, their complacency along with ineffective communication, created a safety culture resulting in a disaster and the loss of seven astronauts. The space shuttle accident illustrated a paradigm shift in accident investigations where not only was the "what" question asked to determine causation, but now the "why" question was asked as well. It was within the "why" question that the socio-technical side of the organization was examined. However, even with the current understanding of how safety culture impacts safety management and leadership, there was no accepted model of safety culture (Choudhry et al., 2007).

Relevant to assessing safety culture, Schein (2004) believed studying culture allowed members of organizations to know what to pay attention to and how to make meaning of the world. Studying culture dealt with the feelings and emotions experienced by individuals within the organization, creating a set of operating assumptions. Schein's defined organization culture as

> . . . a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 17)

Working from this widely accepted definition of organizational culture, the comparison of safety culture definitions and their evolution can be made. The definition started with what was called a *safety climate* to the current distinction between safety climate and *safety culture*. Zohar (1980) offered the first widely used definition of safety climate in reference to what impacts individual worker behavior: "a summary of molar perceptions that employees share about their work environments" (p. 96). Cox and Cox (1991) distinguished safety culture from safety climate by proposing that safety cultures reflect the attitudes, beliefs, perceptions, and values that employees share in relation to safety, while Pidgeon (1991) suggested safety culture was, "the set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimizing the exposure of employees, managers, customers, and members of the public to conditions considered dangerous or injurious" (p. 134).

In 1996, Lee proposed a comprehensive definition suggesting, "the safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the

commitment to, and the style and proficiency of, and organisation's health and safety management" (p. 2). The definition of safety climate progressed further when Cox and Flin (1998) raised the question of whether safety climate was synonymous with safety culture, presuming most safety professionals could not make the distinction. Moving closer to a recognized definition, Guldenmund (2000) clarified safety climate as, "attitudes towards safety within an organization" (p. 215) and safety culture as, "the strong convictions or dogmas underlying the safety attitudes" (p. 215). Guldenmund's view was that organizational culture, not safety culture, should be the central theme within organizations looking to improve safety performance. A few years later, Guldenmund (2007) cited the limitations of measuring a safety culture through questionnaires that identified the attitudes shared throughout the whole company. Given this measurement limitation, he believed safety climate (attitudes) and safety culture were indistinguishable and represented different approaches to determine the priority of safety within an organization.

Taking a comprehensive approach from 1998 onward and recognizing the surge of interest in the safety culture field in all industries, Choudhry et al. (2007) reiterated the lack of accepted definitions for safety climate, safety culture, and safety management, suggesting the terms were used interchangeably and that safety climate was a byproduct of safety culture. Careful to frame their definition within the construction industry, Choudhry et al. (2007) proposed safety culture to be

> the product of individual and group behaviors, attitudes, norms and values, perceptions and thoughts that determine the commitment to, and style and proficiency of, an organization's system and how

its personnel act and react in terms of the company's ongoing safety performance. (p. 1008)

A Safety Culture Model

The lack of an accepted definition stemmed from the dynamic nature of safety culture or, more broadly, organization culture, which was seen as open systems within organizations that must confront internal and external pressures. It was widely accepted that safety climate, a dimension of the overall safety culture, was a necessary component of safety management because numerous structural models had shown it was possible to predict unsafe behavior or accidents (Brown, Willis, & Prussia, 2000; Cheyne, Tomas, Cox, & Oliver, 1999; Thompson et al., 1998) and non-linear models (Guastello, 1989; Guastello, Gershon, & Murphy, 1999). However, as the field progressed, it was defining the dimensions of a safety culture that created the most divide among scholars.

In 1994, Geller proposed a model with three factors—person, behavior, and environment—and 10 principles that provide the foundation for a Total Safety Culture. The model advocated for the process to be led by the workforce and built around empowered, resourced teams. Geller did not address how the safety culture was connected to the overall organization culture and was based mostly around the individuals and behaviors, reflecting an approach influenced by the behavior-based safety model. This model did shift the thinking from safety being a value to safety being a priority.

Unlike Geller's (1994) model, Cooper (2000) argued that people, jobs, and environment as well as psychological, behavioral, and situational factors influenced safety culture. He based his safety culture model on Social Cognitive

Theory. More specifically, Cooper's model worked from the understanding that the interactive and reciprocal relationship between the psychological, behavioral, and situational factors not only influenced accident causation models, but also led to broader change initiatives like Total Quality Management. While Geller's model did not show a connection to the larger organizational culture, Cooper recognized safety culture as a sub-facet of organizational culture, yet did not address the assumptions related to safety within the organization. Cooper's (2000) model did address the issue of creating a safety culture product, suggesting safety culture initiatives should be goal-directed with many sub-goals to evaluate the effectiveness of the work—ultimately reducing injuries and accidents and saving lives. According to Cooper's model, employee's attitudes and perceptions could be assessed by measuring the safety climate through questionnaires, checklists, and audits or inspections.

Implementing a safety culture model required assessing the current safety culture of an organization. Several approaches existed. Recognizing the evolution in safety management approaches and safety culture assessments, Kennedy and Kirwan (1998) proposed the Safety Culture Hazard and Operability approach to identify the vulnerabilities within the safety management processes and the safety culture factors influencing these vulnerabilities. The approach used an accepted methodological framework and analytical process, although it was thought to be very resource-intensive. Cox and Cheyne (2000) provided another assessment of safety culture published as the "Safety Climate Assessment Toolkit." This toolkit used questionnaires, focus groups, behavioral observations, and situational audits to determine the effectiveness of safety

management systems. Cox and Cheyne envisioned this data being used to stimulate discussion and that the tools would adapt to fit the organization, providing a foundation for organizations to learn more about themselves. Glendon and Stanton (2000) argued the advancement of safety culture assessments through a triangulated methodology was needed. This would include safety culture questionnaires, quasi-ethnographic studies, and benchmarking of other companies within a culture where safety was measured regularly, needed follow up was completed, and learning was shared with others.

Characteristics of a Safety Culture

Despite the lack of clarity in a model and the dispute over the dimensions of a safety culture, Choudhry et al. (2007) defined or framed the characteristics of an organization's safety culture to be

> . . . one in which safety is regarded by everyone as being an issue that concerns everyone. As a result, safety rules should be understood and adhered to; all incidents must be reported and investigated quickly for actions to be taken, and for increased learning. (p. 1003)

What Choudhry et al. (2007) implied was a set of characteristics defining a positive safety culture that in theory could be used to assess safety culture.

Several studies existed outlining the positive attributes or characteristics of a safety culture. Much work had been done to attribute the impact of safety culture to major accidents like Chernobyl and the Challenger, but now there was emphasis on attributing an organization's safety culture to individual accidents on a much smaller scale. By examining what the safety climate surveys measured, it was possible to ascertain the accepted characteristics of a positive safety culture (Flin, Mearns, O'Conner, & Bryden, 2000), including management commitment,

supervisor competence, prioritizing safety over production (Hale, 2000), and time pressure. Compiling 10 studies on 20 companies, Shannon, Mayr, and Haines (1997) compared the variables identified with lower injury rates and determined three common characteristics: empowerment of the workforce (Choudhry et al., 2007; Hale, 2000), delegation of safety activities to employees, and top management's participation in health and safety. Conversely, using the same comparisons, the use of discipline and the threat to take issues outside the health and safety committee correlated to increased injury rates.

Mearns, Whitaker, and Flin (2003), citing work at off shore environments, concluded communication around safety issues such as accident and near miss investigations, safety audits, or changes to procedures could be correlated to reducing risks. Contrary to the belief that management support (Shannon et al., 1997) correlated to a decrease in accidents and injuries, Mearns et al. (2003) found the opposite to be true, presuming that management support was high, because of lower safety performance in preceding years. Furthermore, there was limited evidence that management visibility on site discussing safety, often seen as management support, improved overall safety performance. However, in this research, management commitment was cited as one of the crucial elements to a positive safety culture but was not analyzed against accidents and injuries.

Taylor and Taylor (2008) characterized a positive safety culture as one where there was a reporting culture, a just culture, and a learning culture where the first requirement was trust (Choudhry et al. 2007; Hale, 2000; Vecchio-Sudus & Griffiths, 2004), which outlined acceptable and unacceptable behavior. Vecchio-Sudus and Griffiths argued there needed to be: management

commitment demonstrated when resources are provided; employee involvement,

ownership, and commitment; recognized changes in safety attitudes and

behaviors; diverse training on a breadth of safety topics; special campaigns to

highlight safety initiatives; and promotional strategies to enhance safety

awareness. These positive characteristics were promoted when the organization

engaged in proactive, divergent, and judicial thinking.

Summarizing the debate on the characteristics of a positive safety culture

in their article, "The Nature of Safety Culture: A Survey of the State-of-the-Art,"

Choudry et al. (2007) took the position a positive safety culture was one where

there are five components:

> [1] management commitment to safety; [2] management concerns
> for the workforce; [3] mutual trust and credibility between
> management and employees; [4] workforce empowerment; [5] and
> lastly continuous monitoring, corrective action, review of system
> and continual improvements to reflect the safety at the work site.
> (p. 1005)

The characteristics of a positive safety culture allowed for the definition,

methodology, and dimensions to merge into actionable items for an organization.

The Safety Culture Approach Versus Behavior-Based Safety Approach

Defining the debate between behavior-based safety performance

management and safety culture performance management, Cooper (2000) found

> very little research in this area has examined the moderating or
> mediating effects of job-related factors (e.g., team-working, size of
> workgroups, task-complexity, goal-conflicts, task strategies, etc.),
> person factors (goal-commitment, self-efficacy, self-regulation,
> hierarchical level, social status, etc.), and organizational factors
> (e.g., communications, management's commitment, resource
> availability, etc.) on actual safety behaviour and on the
> development of safety culture per se. Similarly, no work has been
> undertaken on the reciprocal relationships between these variables.
> (p. 129)

Dejoy (2005) argued the two approaches (behavior change and culture change) were complementary and the strengths of both should be used to manage safety performance. Behavior-based safety focused safety management on individual safety observations and positive feedback with subsequent behavior modifications if necessary to reduce injuries and accidents, while culture-based safety looked at the influences of culture, specifically beliefs, attitudes, and assumptions, on safety behaviors and safety programs. The argument for behavior-based safety was that it was easier to observe behaviors and produce analytical data, while looking at culture was intuitive and lacking an agreed-upon methodology or model. At a deeper level, behavior-based safety focused on immediate causes, while culture based safety focused on basic causes and took a broader perspective including the environment when addressing safety performance. Culture-based safety creates shared leadership among employees and management to implement organizational change.

The two safety management approaches collided when behavior-based safety management proponents argued the approach was difficult to manage when the organizational culture was non-supportive or dysfunctional (Krause, 1997), yet, it was believed that employee participation in behavioral observations with positive feedback created a positive affect for safety that could lead to culture change (Saari, 1992). This assumed culture change was indirect, and behavior based safety only worked in supportive, functional, trusting environments. Cox, Jones, and Rycraft (2004) recognized trust as an essential component to behavior-based programs. Culture change proponents recognized

trust as a requirement for safety culture change and directly addressed issues of mistrust as a basic cause for accidents and injuries.

Implementation of these two safety management approaches differ. Dejoy (2005) characterized behavior-based safety approaches as bottom-up and culture change safety approaches as top-down (Glendon & Stanton 2000), while Simon and Frazee (2005) and Simon and Cistaro (2009) suggested a grassroots-led, management supported safety culture change process. The concept is that grassroots teams working on culture change could not succeed without management support, and leaders at all levels have to be enlisted and educated.

Simon and Frazee (2005) provided safety culture change methodologies and use the example of the dramatically improved safety performance at General Motors North American manufacturing facilities in their article, "Building a Better Safety Vehicle: Leadership-Driven Culture Change at General Motors." This seminal work argued that safety culture change efforts could be both top-down and bottom-up in approach, challenging the conventional thinking that safety culture change was a top-down safety management approach. The President's Council mandated that the manufacturing managers' council take on the safety culture initiative and address the dismal safety performance results.

> Each year, nearly one of three GM workers was being injured seriously enough to require medical treatment. Nearly five percent of the workforce was being injured seriously enough to miss at least one day of work. GM was averaging about four occupational fatalities per year. Workers' compensation costs exceeded $100 million annually. (p. 36)

While the effort acknowledged and worked within the GM top-down culture, union and management leaders worked together to improve safety.

Ultimately, the strategy implemented cascaded down the safety culture change efforts from plant leadership to supervisory levels and union committee representatives to the shop floor employees. The manufacturing managers' council removed their involvement and turned the process over to plant leadership. After a decade long effort, GM had made safety a corporate priority.

To create a new safety culture at Public Service Electric & Gas, one where there was sustainability and longevity, the organization believed they needed a top-down and bottom-up approach to advance its safety culture. Public Service Electric & Gas initiated three leadership initiatives. One initiative created grassroots safety champions through mentoring and coaching and used a bottom-up approach. Another initiative developed middle managers' understanding of safety culture and their new role in support of employee-led safety. To build internal capacity, an initiative to provide the training for crew leaders to use culture-based tools to solve safety issues and concerns was formed (Simon & Cistaro, 2009).

Medina, McSween, Rost, and Alvero (2009), in their article, "Behavioral Safety in a Refinery: Large-Scale Change and Long-Term Results," provided results of a behavior-based safety initiative at a refinery and correlated the increase in safety observations with the decrease in safety incidents. The behavior-based safety approach implemented at this refinery focused on an employee-led implementation where employees trained one another, conducted safety observations, and published results and actions. The article concluded the behavior-based safety program "has become part of the culture" at the Citgo refinery (Medina et al., 2009, p. 39), indirectly making the argument that a

behavior-based safety program is part of an organization's safety culture. Dejoy (2005) made the argument the research for the two approaches lacked sufficient research of randomized, controlled evaluations to provide a recommendation of one approach over the other.

Current Practices of Leadership Alignment within Safety Management

Frequently, organizations are broken into three groups: management, supervision, and front-line employees. While these three groups have vastly different responsibilities, how they relate to safety within the organization, based on their perceptions and assumptions of safety, impact the overall safety culture within an organization. It was recognized that there needed to be leadership at all levels of the organization as it related to safety culture. Hofmann and Morgeson (1999) were the first to study the effect of leadership on safety records, demonstrating the quality of the relationships between group leaders and their superiors. The relationship was measured through the leader-member exchange level and showed the impact to worker and group safety performance.

Specifically, the leader's safety communication and the leader's declared commitment to safety made a positive impact on safety performance for the worker group, suggesting a high leader-member exchange level reflected a leader's concern for the safety of workers. There was reciprocity in the supervisor worker relationship when the leader-member exchange level was high, promoting trust, openness, and loyalty while encouraging leaders to avoid short-term production pressures at the cost of safety (Pate-Cornell, 1990) and encouraging open communication (Hofmann & Morgeson, 1999). Ironically, and all too true given the space shuttle Columbia's disaster, after the insights in 1990, Pate-

Cornell co-authored an article on the risk analysis for the tiles of the space shuttle, noting this thermal protection system was one of the shuttle's critical subsystems and was vulnerable to debris hits (Pate-Cornell & Fischbeck, 1993).

Zohar (2000) showed an empirical link between the safety climate perceptions related to supervisory safety practices and worker injuries, as measured by microaccidents (minor injuries requiring medical attention). Cooper and Phillip (2004) showed similar data were limited safety climate perceptions were addressed and suggested that in general, "Changes in climate perceptions do not necessarily show changes in behavioral safety performance. Equally, changes in behavioral safety performance are not necessarily reflected in changes in climate perceptions" (p. 510). This statement insinuated the nuanced effect of perceptions and individual behavior recognizing the relationship's impact on an organization's safety culture.

Zohar (2002b) suggested that transformational and transactional leadership, when augmented, influence safety behavior on group members. Specifically, transactional leadership influenced safety through effective monitoring, reliability, and predictability, whereas transformational leadership influenced safety by providing motivation and concern for others. Recognizing the important role of leadership in safety performance, Zohar (2002a) designed a leadership intervention model for supervisors. This model focused on increasing worker interviews to monitor and reward safety performance while providing weekly feedback on the supervisor-worker interactions. These safety-orientation interactions by supervisors, emphasizing the priority of safety over production, showed a significant decrease in minor injury rates, increased ear plug use, and

an increase in safety climate scores. Further developing this intervention, Zohar and Luria (2003) suggested adding these safety-orientation interactions between line-supervisors and managers higher up the organizational hierarchy along with data on employee safety behavior and the relationship of increased supervisor interactions with worker safety. The leadership intervention took a behavioral-based safety approach by measuring the frequency of supervisor safety orientations similar to measuring worker safety observations. Additionally, Zohar and Luria's research involved supervisor quality interactions along with safety interactions showing an increase in quality and production, suggesting an effective supervisor must be able to manage both priorities simultaneously.

Recognizing the role of leadership in keeping workers safe, supervisor-based safety was pioneered by Zohar and Luria (2003). Building on the supervisor relationship, the researchers demonstrated supervisor priorities must align with the strategic priorities of an organization in order to successfully implement safety policies and procedures (Zohar & Luria, 2005). Adding a technical improvement to the supervisor-based safety intervention by placing supervisors physically closer to workers and increasing supervisor visibility increased safety-orientation interactions and increased safety performance (Luria, Zohar, & Erev, 2008).

Beyond recording the supervisor safety related exchanges, an intervention team in the research study by Luria et al. (2008) provided feedback and coaching to first and second line supervisors to improve alignment. Senior management was involved in the same process of feedback and coaching around supervisor-based safety to create alignment across the hierarchy in the organization.

Through biweekly feedback and coaching sessions by the intervention team, essentially modeling the leadership behaviors to implement a system-wide process, the supervisor-based safety process was gradually transferred to the organization's leadership. The alignment process increased the frequency of safety-related interactions at all levels and showed decreased injury rates. The study recognized that, "ongoing exchanges between leaders and members exert a significant effect on leadership as leverage for improving safety" (p. 278).

Hale (2000) suggested it was necessary to aggregate the data by work groups to explain the safety culture at each work group. If the data were explained at each work group, then it would be implausible to get an organization to adopt one safety culture. This suggests the safety culture may not need to be the same for each organizational level. By conducting a safety culture survey of construction workers in Hong Kong, Fung, Tam, Tung, and Man (2005) provided data showing the safety culture divergences between three groups of workers: top management, supervisory staff, and front-line workers. In the study, Fung et al. found significant differences between management and worker groups related to five areas of safety culture: organizational commitment and communication, reporting of accidents and near misses, line management commitment, personal role, and workmates' influence. There was less difference between supervisor and worker groups with just two areas showing significant differences: organizational commitment and communication and reporting of accidents and incidents. Also, there was no significant difference in responses between management and supervisor groups.

Fung et al. (2005) hypothesized the differences arose from the diversity in educational background and sense of responsibility. As solutions to the divergence, Fung et al. advocated for promoting safety awareness through campaigns, and "a proper and open communication channel has to be established among the three groups which can help different levels of staff giving their voices on safety issues in order to narrow down the safety culture divergences among them" (p. 510). While promoting the need for alignment around safety culture, Fung et al. neglected to suggest a method.

More research is needed related to leadership practices within safety. Specifically, Dejoy (2005) identified that few research studies have attempted "to create taxonomies of critical supervisory and management behaviors specific to safety" (p. 121). Identifying these behaviors for management and supervisors would impact the overall safety performance within organizations. By assessing the alignment created within a safety culture change process, these behaviors might be identified.

Chapter 3

Research Methods

The purpose of this thesis was to determine the key components of effective leadership alignment within the safety culture change process. Specifically, it examined leadership alignment within the implementation of safety culture change process at the NCRA in McPherson, Kansas. The safety culture change process was led by Culture Change Consultants, Inc. and was one of NCRA's strategic priorities in order to be recognized as an Occupational Safety and Health Administration voluntary protection programs star site for safety performance. Researching the implementation efforts of NCRA's safety culture change process provided data into leadership alignment interventions moving beyond the assumed role of leadership. This study was conducted in accordance with all requirements put forth by the Institutional Review Board for research on human subjects.

Data were collected starting in December 2009 using surveys, interviews, and focus groups. There was a need to collect both quantitative and qualitative data from employees and stakeholders to identify the structures, messages, and training resulting in leadership alignment around the safety culture change process. While a survey may have determined whether or not there was alignment or misalignment around the safety culture change process, focus groups and interviews were conducted to identify the key actions and messages from leaders. While leaders are formally identified by title, there are informal leaders who may create alignment or misalignment around the safety culture change process.

Phase 1: Group Survey

Grassroots team members, guidance team members, supervisors, and hourly refinery employees received a paper survey (See Appendix A) accompanied by a consent letter from the investigator explaining the purpose of the research study (See Appendix B) This quantified the perceived levels of alignment or misalignment within each stakeholder group impacted by the safety culture change process. Furthermore, related to the safety culture change process, the survey addressed levels of commitment, team communication, management communication, and perceived priorities within the management and hourly employee groups.

At the refinery, 129 employees completed the paper survey—24 salaried and 105 hourly. All responses were confidential. Participation was voluntary and anyone could drop out of the study at anytime without risk.

Phase 2: Focus Groups and Interviews

Following the survey, once the data were analyzed, focus groups and interviews were convened with employee groups to present the data collected. The interviews were intended to identify specific group perspectives. Salaried and hourly employees were separated to keep the comments from affecting employee-supervisory relationships. The interviews were semi-structured around the paper survey questions. The interviews generally lasted 1 hour and were in-depth in order to know and understand employee experiences.

In total, 16 interviews were conducted to address perceptions, meanings, and assumptions of the safety culture change process at NCRA. In total, 25 employees were interviewed, including nine salaried and 16 hourly employees.

Of the interviewees, three employees were guidance team members and eight employees were grassroots team members.

Before beginning the focus groups with hourly employees, participants were asked to keep all comments confidential. As an added measure of protection, individual interviews were offered to anyone who wished to share their views in private. The interviewer had established rapport and trust with the respondents through previous interactions on safety culture grassroots teams and the guidance team. The interview data were recorded using a note-taking method. The responses were anonymous and identified by salaried or hourly as well as by team member and non-team member status. Additionally, focus group comments from hourly employees were associated only with participants' job classification as operations, maintenance, or safety. For salary and supervision employees, only survey and private interviews were conducted to ensure confidentiality. Focus group and interview participants were pulled from subjects completing the survey on a voluntary basis. Emphasis was placed on identifying personal actions, group projects, and safety messages that created alignment or misalignment within the safety culture change process.

Phase 3: Data Analysis

From the research methods in Phase 1 and 2, the data were analyzed to determine what key components of effective leadership within the safety culture change process created alignment or misalignment. To determine the degree of leadership alignment for this initiative, a paper survey was administered to salaried and hourly employees. Their positive responses on the paper survey determined alignment within the safety culture change process. To identify what

actions contributed to creating leadership alignment and surface the necessary actions to move towards stronger leadership alignment, interviews also were conducted with employee groups. Specifically, leaders' actions, communication about the safety culture change process, the organization development interventions, and the team structures were identified and prioritized according to the interview data.

Survey Analysis

Survey data were compiled and analyzed using Stata software and the following modeling process: (a) cleaning the data, (b) conducting a quick factor analysis, (c) compositing the data according to factor analysis and intuition, (d) selecting the most internally consistent composites, (e) justifying the reasons for choices to avoid Type 1 error by running too many tests, (f) analyzing whether Q1 through Q4 predict C4 or C6, (g) explaining why Q2 was bifurcated and why Q4 was ignored, and (h) parsing out variables of interest for tabular graphics.

The objective of the analysis was to identify relationships between work-related demographic indicators and workplace attitudes. Given the large number of items on the survey and the even greater number of possible permutations of data inquiries, it was necessary to avoid blindly building models that would yield statistically significant findings merely as a product of random chance. To limit Type 1 error, clear-cut hypotheses were developed before running a series of regression analyses.

The qualitative research that guided the survey design suggested that four work-related demographic indicators were associated with differences in workplace attitudes. It was hypothesized that:

1. Hourly versus salaried employees experienced the workplace differently.

2. Grassroots and guidance team members were more likely to understand workplace roles and responsibilities than their non-team member peers.

3. More tenured employees would be less cooperative than their neophyte colleagues.

4. Affiliation with a particular employee division (safety, operations, maintenance) impacted attitude towards the safety culture change process.

Unfortunately, because there was no perfect linear relationship between the categorical classifications of the demographic factors of interest, the challenge was to draft intelligent hypotheses that did not require a multiplicity of indicator variables and accompanying statistical tests, thereby, increasing the researcher's likelihood of committing Type 1 error. For the fourth demographic factor (employee division), the data were not dichotomized into the three response categories. Instead, the first three demographic factors were selected to provide the basis of the analysis. Given the understanding of workplace dynamics in this refinery, it was believed that demographic factors 1-3 would better serve the inquiry. For demographic factor 2, again seeking to decrease Type 1 error, the response categories were bifurcated into two groupings of "team membership" and "no team membership".

To continue the analysis, it was necessary to determine a set of underlying latent constructs, each of which represented a particular area of work-related perceptions. There was a need to better understand how employee

position and ranking was associated with sentiments about workplace circumstances. The survey was built with several separate constructs in mind. After an initial factor analysis, the data showed that some items did not group together as expected and were investigated further by determining the Cronbach's Alpha value for the clusters of items believed to belong within each individual construct (See Tables 1 and 2). A pair of orthogonal constructs, addressing "alignment" and "role of teams," demonstrated high overall Alpha values (0.80 and 0.78, respectively). Alignment is referred to as Composite 1 and "role of teams" as Composite 2.

After obtaining two internally consistent constructs, it was possible to create a parsimonious model to determine the demographic factors that were most predictive of scores on these two composite indices. Two final models were built using stepwise regression, performing separate tests of independent variables before expanding the model.

Table 1

Standardized, Inter-Item Correlations for Composite 1 (Alignment)

Item	Obs	Sign	item-test correlation	item-rest correlation	average inter-item correlation	alpha
q14	127	+	0.7479	0.5797	0.4470	0.7638
q18	129	+	0.6552	0.4545	0.5062	0.8039
q20	128	+	0.7929	0.6491	0.4164	0.7405
q22	125	+	0.7721	0.6216	0.4304	0.7514
q23	124	+	0.7712	0.6179	0.4316	0.7523
Test scale					0.4462	0.8011

N = 129

Table 2

Standardized, Inter-Item Correlations for Composite 2 (Role of Teams)

Item	Obs	Sign	item-test correlation	item-rest correlation	average inter-item correlation	alpha
q9	128	+	0.6944	0.4591	0.5630	0.7944
q15	129	+	0.8031	0.6241	0.4421	0.7039
q16	126	+	0.8302	0.6717	0.4156	0.6809
q26	123	+	0.7943	0.6064	0.4578	0.7170
Test scale					0.4694	0.7797

N = 129

The first model in the final analysis revealed a statistically significant relationship between the "alignment" composite and demographic factor 1 (hourly versus salaried). The coefficient on the predictor variable (0.553) described the positive association between "alignment" score and salaried employees. In context, it showed, on average, salaried employees scored 0.553 points higher on the "alignment" index than hourly employees (See Table 3). The t-value of 4.41 and the corresponding p-value of < 0.0001 suggested a robust finding unlikely to be the result of random chance.

Table 3

Ordinary Least-Squares Regression, Composite 4 (Alignment) on Question 1 (Hourly/Salaried)

Source	SS	df	MS			
				Number of obs =		129
				$F_{(1, 127)}$ =		19.42
Model	5.98972851	1	5.98972851	Prob > F =		0.0000
Residual	39.176941	127	.30847985	R-squared =		0.1326
				Adj R-squared =		0.1258
Total	45.1666695	128	.352864606	Root MSE =		.55541

c4	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
q1	.5537301	.1256632	4.41	0.000	.3050654	.8023948
_cons	3.11754	.1568596	19.87	0.000	2.807143	3.427937

N = 129

The second model in the final analysis found an intuitive result, showing strong association of "role of teams" to both demographic factors 1 and 2 (team membership). The respective coefficients of the two predictors (0.699 and -0.491) explained that (a) salaried employees, on average, scored 0.699 points higher on the "role of teams" index and that (b) team members scored 0.491 points higher on the "role of teams" index than their non-team member peers (See Table 4). The statistical analysis verified a logical assumption: Team members better understood the role of teams within the safety culture change process and could express that sentiment. The t-value of 5.18 and the corresponding p-value of <0.0001 suggested a robust finding unlikely to be the result of random chance.

Table 4

Ordinary Least-Squares Regression, Composite 6 (Role of Teams) on Question 2 (Teams/Non-Team) and Question 1 (Hourly/Salaried)

Source	SS	df	MS			
				Number of obs =		128
				F(2, 125) =		23.06
Model	15.8397852	2	7.91989261	Prob > F =		0.0000
Residual	42.9388062	125	.343510449	R-squared =		0.2695
				Adj R-squared =		0.2578
Total	58.7785914	127	.462823554	Root MSE =		.5861

c6	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
q1	.6995239	.1349715	5.18	0.000	.4323986	.9666492
q2_2	-.4911732	.1152538	-4.26	0.000	-.7192749	-.2630716
_cons	3.701927	.262285	14.11	0.000	3.182833	4.221022

N = 128

Focus Group and Interview Analysis

In analyzing the data, salaried and hourly employee comments were separated and the non-team member and team member descriptors were

deleted for anonymity. Low-inference descriptive codes were used to make sense of the initial responses. An open-coding approach was used to make comparisons and to generate further questions. The codes used were: salaried employees' actions around safety, hourly employees' actions around safety, guidance team and grassroots team structure, grassroots team projects, guidance team projects, the changes in safety since the safety culture change process began, and communication about safety.

The open-coding approach led to more specific targets. Based on the quantitative data, leaders' actions, team membership experiences, and how hourly and salaried employees viewed the company's commitment to the safety culture change process were targeted in the coding. Higher-inference pattern codes were used to bring together the descriptive codes, or indicators, into themes.

In total, five themes were created: (a) both salaried and hourly employees' actions showed commitment to the safety culture change process, (b) guidance team and grassroots team structures created alignment within the safety culture change process, (c) grassroots team and guidance team projects impacted the direction of the safety culture change process, (d) the overall perceptions of safety changed as a result of the safety culture change process, and (e) communication of safety and the safety culture change process mattered to employees (see summary of themes chart). While coding, memoing was used to theorize about the data reviewed. At the same time, conclusions were drawn regarding the data by integrating the qualitative data with the quantitative data.

Lastly, the research data was gathered from January 2010 through February 2010. At the beginning of 2010, there was an increase in incidents and injuries and a contractor fatality, the first in NCRA's 65-year history. These events may have influenced both the quantitative and qualitative responses from employees. Following the research study, a brief overview of the results was provided to NCRA employees. When requested, the full research study was shared electronically with employees.

Chapter 4

Findings

The purpose of this thesis was to determine the key components of effective leadership alignment within the safety culture change process. Specifically, it examined leadership alignment within the implementation of safety culture change process at the NCRA in McPherson, Kansas. The safety culture change process was led by Culture Change Consultants, Inc. and was one of NCRA's strategic priorities in order to be recognized as an Occupational Safety and Health Administration voluntary protection programs star site for safety performance. Researching the implementation efforts of NCRA's safety culture change process provided data into leadership alignment interventions moving beyond the assumed role of leadership. Chapter 4 presents the five key research findings of leadership alignment within a safety culture change process at NCRA.

Key findings for this study are as follows:

1. Both salaried and hourly employees' actions showed commitment to the safety culture change process. The qualitative data suggested salaried employees were more aware of actions that demonstrated commitment to the safety culture change process. Both hourly and salaried employees regarded allocating time and spending funds on the safety culture change process and taking the time to listen as showing commitment. While salaried employees identified specific behaviors of salaried leadership that demonstrated commitment to safety, such as visibility in the refinery, honest dialogue, apologizing, and following safety policies and procedures, hourly employees did not mention these behaviors. Salaried employees routinely spoke of how hourly

employees showed a high level of commitment to the safety culture change process by participating during unpaid time. Hourly employees did not refer to unpaid time. That said, the quantitative data from salaried employees on the survey were more positive than hourly employee data. Both the qualitative and quantitative data suggested the horizontal alignment between salaried employees was stronger than the horizontal alignment of hourly employees within the safety culture change process. Additionally, the data suggested the vertical alignment between salaried employees and hourly employees within the safety culture change process was disconnected.

2. Guidance team and grassroots team structure created alignment within the safety culture change process. The qualitative data showed the guidance team and grassroots team structure created alignment within the safety culture change process. The guidance team and grassroots teams were made up of both salaried and union employees with the grassroots teams being coached by a member of the guidance team. Both salaried and hourly employees believed the heterogeneity of employee levels on the guidance team and grassroots teams mattered. The team structure without a hierarchy and with each member having one vote allowed both employee groups to believe hourly employees had ownership within the safety culture change process. This alignment of employees participating on teams was reinforced by the quantitative data showing higher responses by employees on safety culture change teams. Even though there were more hourly employees participating on safety culture change teams, hourly employees responded with lower scores. These data suggested hourly

employees were unaware of the level of hourly employee ownership in the safety culture change process.

3. Grassroots team and guidance team projects impacted the direction of the safety culture change process. According to the qualitative data, the grassroots team and guidance team projects impacted the direction of the safety culture change process. The projects were visible and reinforced the attention given to improve the safety culture at NCRA. Hourly employees believed the grassroots team projects demonstrated how hourly and salaried employees worked in partnership, and non-team members were asked for input on the projects.

The guidance team project that created a new safety incentive program built on choice, ownership, and participation was seen as improving safety at the refinery. Hourly and salaried employees believed the safety incentive program gave employees ownership of their personal safety. Additionally, salaried employees cited an increase in safety reporting and an increase in safety communication at the 8:00 am meetings. Hourly employees believed the new incentive program increased the number of safety meetings from one to five on a voluntary basis. While the comments were positive regarding the new safety incentive program, few employees recognized the program as a safety culture guidance team project. This may have influenced the lower responses of hourly employees on the survey.

4. The overall perceptions of safety changed as a result of the safety culture change process. Employees' actions showing commitment, the guidance team and grassroots team structure, and the safety culture change projects

emerged as themes from the qualitative data that influenced perceptions of safety at NCRA. Data suggested both hourly and salaried employees believed the safety culture change process influenced the decision to have both employee groups participate in root cause accident investigations. Because of the open and candid dialogue between hourly and salaried employees on guidance and grassroots teams, many employees felt they could now speak openly and honestly about safety. As a result of the safety culture change process, salaried employees believed the company was taking time to operate safely, and hourly employees felt they would stop a fellow employee working unsafely regardless of repercussions.

5. Communication of safety and the safety culture change process mattered to employees. According to the qualitative data, the way in which safety and the safety culture change process was communicated presented another theme. Salaried employees believed the company was headed in the right direction and there was alignment within the company for the safety culture change process. Salaried employees recognized how their actions and how they communicated influenced the safety perceptions of hourly employees. Both groups believed fellow employees were more serious about safety since starting the safety culture change process, as shown by the increased communication about safety procedures, reporting, and concerns. Increased communication was attributed to the open dialogue between hourly and salaried employees (see Table 5).

Table 5

Summary of Themes from Qualitative Data

Themes	Hourly Employee Responses	Salary Employee Responses
1. Employees' actions showed commitment to the safety culture change process.	• Given time to attend safety culture change meetings and providing monetary resources for safety culture change process. • Leaders taking the time to listen first to concerns rather than to just react. • Employees assume leaders are insincere when talking about safety.	• Give time to attend safety culture change meetings and provide monetary resources for safety culture change process. • Leaders take the time to listen first to concerns and not just react, engage in honest and candid dialogue, and apologize for making mistakes during the leadership alignment dialogues. • Leaders follow safety policies and procedures, be visible (on site) within the refinery or plant, provide detailed and specific safety information at every meeting, respond to safety concerns in a timely manner, and remind people if safety policies and procedures are not followed.
2. Guidance team and grassroots team structure created alignment within the safety culture change process.	• Hourly and salaried employees participate on the same teams. • Have shared ownership of the process.	• Joint decision making and open communication—one vote, one person--and employees from all levels. • Hourly employees work directly with upper management, have shared ownership of the safety culture change process, and leadership opportunities are created. • Unsure about how to support the process if they are not on a team.
3. Grassroots team and guidance team projects impacted the direction of the safety culture change process.	• Working with salaried employees to complete projects. • Grassroots teams are presenting projects at safety meetings and asking for input on the projects from peers.	• The increased signage project is making a difference. • The grassroots team projects make the safety culture change process more visible and reinforce the message of safety culture change.

Table 5 (Continued)

Themes	Hourly Employee Responses	Salary Employee Responses
4. The overall perceptions of safety changed as a result of the safety culture change process.	• Joint participation with salaried employees in root cause accident investigations. • Open dialogue about safety between hourly and salaried employees. • Willing to say to one another "This is how we do it safely," regardless of repercussions.	• All employees can speak openly about safety now. • Upper management is participating in root cause accident investigations. • Company is taking the time to operate safely.
5. Communication of safety and the safety culture change process mattered to employees.	• Feel the selection process for guidance team and grassroots team members is unclear. • Feel they are not receiving communication about the guidance team and there is no constant update about the safety culture change process in a uniformed format.	• Communication at all levels about the safety culture change process, but needs to get better. • Communication from the grassroots teams at monthly supervisor meetings and communication from the safety department about the guidance team and grassroots teams is effective.

Chapter 5

Conclusions

The purpose of this thesis was to determine the key components of effective leadership alignment within the safety culture change process. Specifically, it looked at leadership alignment within the implementation of safety culture change process at the NCRA in McPherson, Kansas. Researching the implementation efforts of NCRA's safety culture change process provided data regarding leaders' actions, employee perceptions, and leadership alignment interventions. This chapter presents conclusions, recommendations to managers, recommendations to organization development professionals, limitations of the research, and suggestions for further research.

1. The safety culture change process at NCRA was successful. The NCRA safety culture assessment was completed in September 2008, and the findings were reported back in November 2008. The safety culture change process at NCRA began when the guidance team, comprised of hourly and salaried employees, was formed in January 2009 and tasked with feeding back the safety culture report to all employees. In April 2009, four safety culture grassroots teams formed to work on projects generated from the issues identified in the safety culture survey report and during the survey feedback session.

In 2007 and 2008, the recordable accidents and injury rate at NCRA was 3.2 and 3.1. In 2009, the accident and injury rate was 2.0 (See Table 6). Also, in 2008, the lost time cases rate and lost work days went from 1.4 and 18.8, respectively, to 0.0 and 0.0 in 2009. All three indicators presented a down trend in rates and an increase in safety performance for 2009 (See Figure 1). During
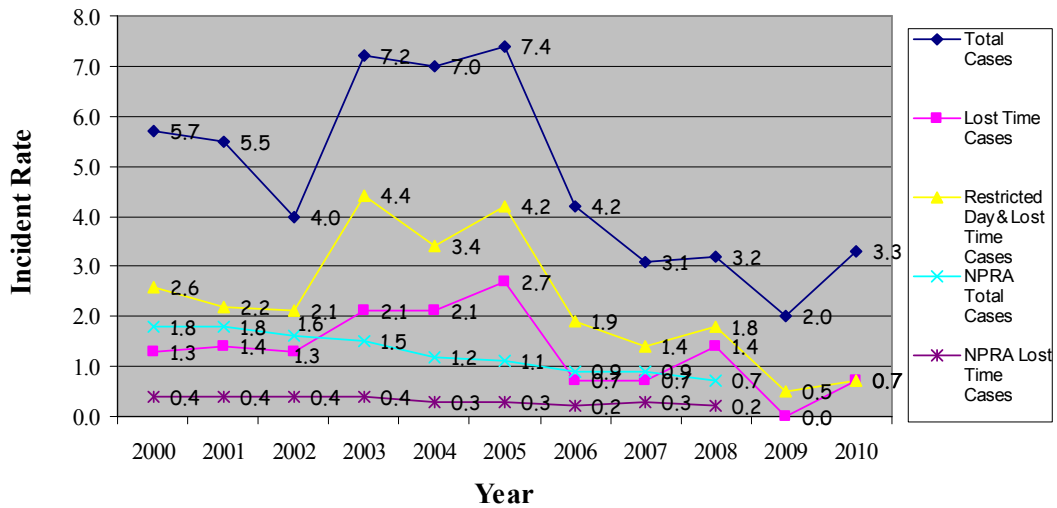
the interviews, both hourly and salaried employees believed the improved safety

performance was a result of the safety culture change process.

Table 6

National Cooperative Refinery Association Total Lost Time, Restricted Day, and Lost Work Days Versus National Petroleum Refining Association Total Cases

Year	Total Cases	Lost time cases	Restricted day and lost time cases	Lost work days	NPRA Total cases	NPRA Lost time cases
2000	5.7	1.3	2.6	41.9	1.8	0.4
2001	5.5	1.4	2.2	54.9	1.8	0.4
2002	4.0	1.3	2.1	44.4	1.6	0.4
2003	7.2	2.1	4.4	54.0	1.5	0.4
2004	7.0	2.1	3.4	22.0	1.2	0.3
2005	7.4	2.7	4.2	126.0	1.1	0.3
2006	4.2	0.7	1.9	6.3	0.9	0.2
2007	3.1	0.7	1.4	17.6	0.9	0.3
2008	3.2	1.4	1.8	18.8	0.7	0.2
2009	2.0	0.0	0.5	0.0	1.1	0.8

Note. From unpublished data, NCRA Safety Department Database. McPherson, KS: NCRA. Retrieved April 13, 2010. Reprinted with permission.; NPRA = National Petroleum Refining Association

Note. From unpublished data, NCRA Safety Department Database. McPherson, KS: NCRA. Retrieved April 13, 2010. Reprinted with permission.; NPRA = National Petroleum Refining Association

Figure 1

National Cooperative Refinery Association Total Lost Time, Restricted Day, and Lost Work Days Versus National Petroleum Refining Association Total Cases Through May 2010

2. Continuing the safety culture change process is necessary to improve NCRA's safety performance. As of April 2010, there were 3.3 recordable injuries (see Table 7). The increase in recordable incidents and injuries in 2010 suggested the efforts to improve the safety culture at NCRA lost momentum. The company received a NPRA Gold Award recognizing facilities with a 25% or greater reduction in the Total Recordable Incidence Rate with no workplace-related fatality of an employee or non-employee during 2009, as compared to the average Total Recordable Incidence Rate for the three previous calendar years. This recognition may have influenced managers and employees to feel they had done enough to stay safe. However, to improve safety culture and safety performance requires attention to detail and employee perceptions of safety within the organization. Leaders must make a commitment to stay the course and continue to build the capacity and structures to improve safety culture.

Table 7

National Cooperative Refinery Association Total Lost Time, Restricted Day, and Lost Work Days Versus National Petrochemical and Refiner's Association Total Cases through May 2010

Year	Total Cases	Lost time cases	Restricted day and lost time cases	Lost work days	NPRA Total cases	NPRA Lost time cases
2000	5.7	1.3	2.6	41.9	1.8	0.4
2001	5.5	1.4	2.2	54.9	1.8	0.4
2002	4.0	1.3	2.1	44.4	1.6	0.4
2003	7.2	2.1	4.4	54.0	1.5	0.4
2004	7.0	2.1	3.4	22.0	1.2	0.3
2005	7.4	2.7	4.2	126.0	1.1	0.3
2006	4.2	0.7	1.9	6.3	0.9	0.2
2007	3.1	0.7	1.4	17.6	0.9	0.3
2008	3.2	1.4	1.8	18.8	0.7	0.2
2009	2.0	0.0	0.5	0.0	1.1	0.8
2010	3.3	0.7	0.7	42.2		

Note. From unpublished data, NCRA Safety Department Database. McPherson, KS: NCRA. Retrieved April 13, 2010. Reprinted with permission.; NPRA = National Petroleum Refining Association

During 2009, employees frequently raised the issue of improper use of fall protection. The norms and assumptions around fall protection identified potential risks to employees. Tragically, on February 9, 2010, a contractor worker was killed on the refinery work site. A piece of scaffolding broke and the contractor was not properly wearing fall protection. While the contractor was not a NCRA employee, employees showed sympathy and concern. A joint hourly and salaried committee was convened to investigate the accident and all use of scaffolding was suspended for 2 weeks. The employees cited the safety culture change process as the reason for the joint committee and the open, honest dialogue from leaders. There was commitment from leaders to continue the safety culture change efforts and to support a culture where employees learn from mistakes.

3. The guidance team and grassroots team structure created alignment and helped sustain the safety culture change process. According to Dejoy (2005), one of the strengths of culture-based safety was creating shared leadership among employees and management to implement organizational change. O'Reilly et al. (2005) provided research on leadership alignment suggesting leaders at all levels should be considered to understand how they were aligned in support of new strategies, specifically at intermediate levels. The research findings suggested higher levels of alignment around the safety culture change process from safety culture "team members" versus "non- team members."

From an organizational design perspective, Simon and Frazee (2005) suggested safety culture change could be designed as both top-down and bottom-up in approach. The safety culture guidance team at NCRA, comprised of

hourly and salaried leaders, vice presidents, supervisors, and union leaders structurally created alignment vertically within the organization. Membership on the guidance team was carefully thought out and agreed upon jointly by management and union leadership. The heterogeneity of employee levels allowed the guidance team to look collectively at leadership within the refinery. The safety culture team structure created shared ownership of the process and joint participation from employee levels. The structure was able to be maximized following the contractor fatality in February 2010. Grassroots team 5 planned a safety culture change project aimed at changing the norms and assumptions related to fall protection. Its objective was to create the norm that *all* employees wear fall protection *every* time fall protection was needed.

The membership of four safety culture grassroots teams in April 2009 were made up of mostly hourly employees with one salaried supervisor and one member of the guidance team functioning as the coach (Simon & Cistaro, 2009). Again, the organization design created vertical alignment and allowed for collective thought to be considered as the safety culture change process was implemented. The survey data suggested alignment was created through the team structure as evidenced by the higher positive responses by "team members" than "non team members."

In organizations that are peer-like and collaborative, similar to the guidance team and grassroots team structure, Drath et al. (2008) suggested a new definition for leadership was needed to inform leaders' actions beyond leadership, followers, and shared goals. Drath et al. (2008) stated that leadership should focus on direction, alignment, and commitment as short-term criterion,

which should be seen as an iterative process to produce long-term goals. Both the grassroots teams and the guidance team assessed their effectiveness in September 2009 during a team health check. The team health check allowed team members to assess how their team was functioning and the effectiveness of their safety culture change project. The grassroots teams recognized how not following the team ground rules and not adhering to team roles and responsibilities impacted their effectiveness. Additionally, the grassroots teams identified they had not been following their initial project plan and had lost direction. The process reflected the creation of direction, alignment, and commitment as short-term goals for team members to improve safety performance at NCRA.

4. Leadership alignment dialogues for supervisors impacted the supervisors' perceptions of safety. The research findings found salaried employees responded more positively than hourly employees on the paper survey. The principle of leadership alignment was more nuanced at lower levels of management than at the upper management levels (Guth & Macmillan, 1986). Within the safety culture change process, leadership alignment dialogues addressed issues of horizontal and vertical alignment between supervisors and upper management, but not with hourly employees.

In the group interviews, salaried employees commented on the impact of the leadership alignment dialogues. Salaried employees believed upper management allowed for open and honest dialogue about safety issues and demonstrated leadership by apologizing for mistakes.

Additionally, Hofmann and Morgeson (1999) were the first to study the effect of leadership on safety records and demonstrated the value of the relationship between group leaders and their superiors and the positive impact on employee and group safety performance. Salaried employees noticed an increase in communication about safety at daily meetings and open and honest communication at the leadership alignment dialogues. Direction, alignment, and commitment were being created around the safety culture change process as a result of the improved relationship between supervisors and upper management at the leadership alignment dialogue sessions and in daily meetings.

Recommendations to Managers

The research findings inform discussions of future recommendations to managers seeking to create vertical and horizontal alignment within a safety culture change process. For instance, it is unknown if safety culture team membership causes greater understanding of "role of teams," or if those individuals with pre-existing greater understanding of "role of teams" were thereby more likely to join a team. Although the directionality of this association remains unknown, results suggested the following recommendations.

1. Team membership should be encouraged and more widely implemented as a follow-up to the data findings, suggesting team members were more aligned than non-team members. Team membership encouraged participation and collaboration from employees in the overall safety process at NCRA. The cross-functional teams created a networked group of employees able to address specific norms and assumptions within the NCRA safety culture.

2. Prior to selecting team members, a team member skill matrix should be created for heterogeneous teams, identifying team member skills and employees who are informal leaders and influencers.

3. Given the survey data showing salaried employees responded more positively than hourly employees, managers should continue the leadership alignment dialogue workshops. Beyond the 18 managers currently participating in the workshops at NCRA, the remaining managers should begin the workshops within 6 months to maintain continuity in the safety culture change effort.

4. The practice of supervisors making personal commitments to safety and being accountable to their peers should become standard practice for evaluations. One of the deliverables to the leadership alignment dialogue workshops was supervisors making personal commitments to safety. Supervisor interviews suggested the commitments impacted safety performance. Data should be gathered from peers and supervised employees as well as self-reports as to whether the personal commitments were fulfilled. The practice allowed supervisors to be conscious of their actions and the messages communicated around safety.

Recommendations to Organization Development Professionals

1. It is recommended the alignment survey be given to specific units within the company instead of distributing a company-wide survey. This would allow for targeted interventions in specific units at the refinery based on the level of true alignment, skewed alignment, or forced alignment. Not only would targeting specific units be cost effective to clients, but also the organization development

professionals and internal culture change champions would be able to generate useful learning data to be used with future company units.

2. To create horizontal alignment of hourly employees, similar to the leadership alignment dialogues for supervisors, it is recommended that leadership alignment dialogues be completed with targeted units. Based on Zohar's (2002b) research, suggesting transformational leadership influenced safety performance when supervisors provided encouragement and showed concern for others, the alignment dialogues would target the relationship between supervisors and hourly employees. The alignment dialogues for hourly employees and supervisors would assess whether the supervisors' priorities align with the organization's strategic priorities to successfully implement safety policies and procedures (Zohar & Luria, 2005).

3. A formal structure to coach upper management on safety culture change communications and actions should be created. The coaching would focus on creating alignment, direction, and commitment to sustain the safety culture change efforts, while dialoguing about short-term and long-term goals. Upper management would have bi-monthly calls with a safety culture change coach and specifically focus on leadership actions designed to create alignment, both horizontally and vertically within the organization.

Limitations

1. Administering a voluntary, paper survey to employees showed a limited response rate. In the future, an electronic survey may lend itself to a higher response rate and include the majority of refinery employees. More specifically,

the language used for the survey questions could be refined and piloted before administering future surveys.

2. The research study gathered the qualitative data using a note-taking method instead of recording the interviews. The qualitative data were influenced by the interviewer's biases and the accuracy of the respondents' memories. Future research may include recording the interviews to allow for a researcher to analyze the specific language used by employees, working from the perspective that language is the central feature of the socio-cultural situation (Punch, 2005).

3. Lastly, the research study occurred over a 2-month time period, limiting the ability to collect data at multiple points within the safety culture change process. Collecting data at multiple points over the course of at least 1 year would allow for more data to be analyzed. Specific interventions, like leadership alignment dialogues, supervisor dialogues in specific units, and upper management coaching, could be assessed in relation to a larger time frame.

Suggestions for Further Research

1. When planning further research, it is helpful to recognize addressing employee needs should focus on structural groupings, not years of experience within the refinery. It was surprising to find that demographic factor 3 lacked association with the constructs of interest ("alignment" and "role of teams"). The stepwise regression model-building technique would have revealed any significant relationship between the composites and this factor, even if it were less strongly correlated than connections with other demographic factors. For this set of data, it can be argued there was no evidence to suggest any relationship between duration of employment and the workplace attitudes measured. Given

this data, further research regarding supervisor and employee relationships and grassroots and guidance team experiences could provide insights into demographic factors influencing the process.

2. Also, it is unknown if the September 2009 team health check intervention created direction, alignment, and commitment within the safety culture change process. The team health check intervention was designed to calibrate and align the grassroots and guidance teams. The anecdotal feedback from team members and coaches was positive. A longitudinal study on the effectiveness of team health check interventions within the safety culture change process is suggested.

3. Lastly, continued research on leadership alignment within a safety culture change process is suggested at NCRA and other client organizations to identify leaders' actions, employees' commitment, and overall safety performance. Further research is needed to discover how alignment, direction, and commitment are built through employee networks. A longitudinal study on leadership alignment is suggested to provide enough data to track alignment throughout a safety culture change process, which lasts 5 to 7 years at a single site.

References

References

Argyris, C. (1979). Reflecting on laboratory education from a theory of action perspective, *Journal of Applied Behavioral Science, 15*(3), 296–310.

Brown, K. A., Willis, P. G., & Prussia, G. E. (2000, June). Predicting safe employee behavior in the steel industry: Development and test of a sociotechnical model. *Journal of Operations Management, 18*(4), 445–465.

Bureau of Labor Statistics**.** (n.d.). *Industries at a glance: Petroleum and Coal Products Manufacturing: NAICS 324*. Retrieved April 13, 2009, from http://www.bls.gov/ iag/tgs/iag324.htm

Burman, R., & Evans, A. (2008). Target zero: A culture of safety. *Defence Aviation Safety Centre Journal*, 22–27.

Cheyne, A., Tomas, J. M., Cox, S., & Oliver, A. (1999). Modeling employee attitudes to safety: A comparison across sectors. *European Psychologist, 4*(1), 1–10.

Choudhry, R. M., Fang, D., & Mohamed, S. (2007, December). The nature of safety culture: A survey of the state-of-the-art. *Safety Science, 45*(10), 993–1012.

Columbia Accident Investigative Board. (2003, August). *Report volume 1*. Washington, DC: U.S. Government Printing Office.

Cooper, M. D. (2000, November). Towards a model of safety culture. *Safety Science, 36*(2), 111–136.

Cooper, M., & Philip, R. (2004). Exploratory analysis of the safety climate and behavioral relationship. *Journal of Safety Research*, 35, 497–512.

Cox, S., & Cox, T. (1991, April). The structure of employee attitudes to safety: A European example. *Work and Stress, 5*(2), 93–106.

Cox, S., & Flin, R. (1998, July). Safety culture: Philosopher's stone or man of straw? *Work and Stress, 12*(3), 189–201.

Cox, S., & Cheyne, A. (2000, February). Assessing safety culture in offshore environments. *Safety Science, 34*(1-3), 111–129.

Cox, S., Jones, B., & Rycraft, H. (2004, November). Behavioural approaches to safety management within UK reactor plants. *Safety Science, 42*(9), 825–839.

Dejoy, D. (2005, February). Behavior change versus culture change: Divergent approaches to managing workplace safety. *Safety Science, 43*(2), 105–129.

Drath, W. H., McCauley, C. D., Palus, C. J., Van Velsor, E., O'Connor, P. M. G., & McGuire, J. B. (2008, December). Direction, alignment, commitment: Toward a more integrative ontology of leadership. *The Leadership Quarterly, 19*(6), 635–653.

Flin, R., Mearns, K., O'Conner, P., & Bryden, R. (2000, February). Measuring safety climate: Identifying the common features. *Safety Science, 34*(1-3), 177–192.

Fung, I., Tam, C., Tung, K., & Man, A. (2005, October). Safety culture divergences among management, supervisory and worker groups in Hong Kong construction industry. *International Journal of Project Management, 23*(7), 504–512.

Geller, E. S. (1994, September). Ten principles for achieving a total safety culture. *Professional Safety, 39*(9), 18–24.

Glendon, A. I., & Stanton, N. A, (2000, February). Perspectives on safety culture. *Safety Science, 34*(1-3), 193–214.

Goleman, D., Boyatzis, R., & McKee, A. (2002). *Primal leadership: Realizing the power of emotional intelligence.* Boston: Harvard Business School Press.

Guastello, S. J. (1989, February). Catastrophe modeling of the accident process: Evaluation of an accident reduction program using the occupational hazards survey. *Accident Analysis and Prevention, 21*(1), 61–77.

Guastello, S. J., Gershon, R. R. M., & Murphy, L. R. (1999, November). Catastrophe model for the exposure to blood-borne pathogens and other accidents in health care settings. *Accident Analysis and Prevention, 31*(6), 739–749.

Guldenmund, F. W. (2000). The nature of safety culture: A review of theory and research. *Safety Science, 34*(1-3), 215–257.

Guldenmund, F. W. (2007, July). The use of questionnaires in safety culture research—An evaluation. *Safety Science, 45*(6), 723–743.

Guth, W. D., & Macmillan, I. C. (1986, July). Strategy implementation versus middle management self-interest. *Strategic Management Journal, 7*(4), 313–327.

Hale, A. (2000, February). Culture's confusions. *Safety Science, 34*(1-3), 1–14.

Hofmann, D., & Morgeson, F. (1999, April). Safety-related behavior as a social exchange: The role of perceived organizational support and leader-member exchange. *Journal of Applied Psychology, 84*(2), 286–296.

International Atomic Energy Agency. (1991). *Safety culture: A report by the International Nuclear Safety Advisory Group* (safety series No. 75-INSAG-4). Vienna: Author.

Katzenbach, J. and D. Smith. (2003). *The wisdom of teams: Creating the high performance organization.* New York: Collins Business.

Kennedy, R., & Kirwan, B. (1998, December). Development of a hazard and operability–based method for identifying safety management vulnerabilities in high risk systems. *Safety Science, 30*(3), 249–274.

Krause, T. R. (1997). *The behavior-based safety process: Managing involvement for an injury-free culture* (2nd ed.). New York: John Wiley & Sons.

Lee, T. R. (1996, October). Perceptions, attitudes and behaviour: The vital elements of a safety culture. *Health and Safety*, 1–15.

Lund, R., & Gjerding, A. (1996, December). *The flexible company: Innovation, work organization and human resource management.* (Danish Research Unit for Industrial Dynamics Working Paper No. 96-17). Retrieved April 13, 2009, from http://papers.ssrn.com/soL3/papers.cfm?abstract_id = 54245

Luria, G., Zohar, D., & Erev, I. (2008). The effect of workers' visibility on effectiveness of intervention programs: Supervisory-based safety interventions. *Journal of Safety Research, 39*(3), 273–280.

Mearns, K., Whitaker, S., & Flin, R. (2003, October). Safety climate, safety management practice and safety performance in offshore environments. *Safety Science, 41*(8), 641–680.

Medina, R., McSween, T., Rost, K., & Alvero, A. (2009, August). Behavioral safety in a refinery: Large scale change and long-term results. *Professional Safety*, 35–40.

NCRA. (2009). *2009 annual report*. Retrieved April 13, 2009, from http://www.ncra.coop/ 2009/10/2009AnnualRpt.pdf

NCRA. (2010). Safety department database. McPherson, KS: NCRA. Unpublished data.

O'Reilly, C. A., Caldwell, D., & Chatman, J. (2005, June). *How leadership matters: The effects of leadership alignment on strategic execution.* (Stanford Graduate School of Business Research Paper No. 1895). Retrieved June 24, 2009, from http://papers.ssrn.com/sol3/papers. cfm?abstract _id = 742707

Pate-Cornell, E. (1990, November). Organizational aspects of engineering system safety: The case of offshore platforms. *Science, 250*(4985), 1210–1217.

Pate-Cornell, E., & Fischbeck, P. S. (1993). Probabilistic risk analysis and risk-based priority scale for the tiles of the space shuttle. *Reliability Engineering & System Safety, 40*(3), 221–238.

Pidgeon, N. F. (1991). Safety culture and risk management in organizations. *Journal of Cross-Cultural Psychology, 22*(1), 129–140.

Punch, K. F. (2005). *Introduction to social research: Quantitative and qualitative approaches* (2nd ed.). Thousand Oaks, CA: Sage.

Saari, J. (1992). Successful implementation of occupational health and safety programs in manufacturing for the 1990s. *International Journal of Human Factors in Manufacturing, 2*(1), 55–66.

Schein, E. (2004). *Organizational culture and leadership* (3rd ed.). San Francisco: Jossey-Bass.

Shannon, H. S., Mayr, J., & Haines, T. (1997, August). Overview of the relationship between organizational and workplace factors and injury rates. *Safety Science, 26*(3), 201–217.

Simon, S. I. (1999). On the future of the safety profession. In G. Swartz (Ed.), *Safety culture and effective safety management*. (pp. 3–16). Chicago, IL: National Safety Council Press.

Simon, S. I., & Frazee, P. R. (2005, January). Building a better safety vehicle: Leadership driven culture change at General Motors. *Professional Safety*, 36–44.

Simon, S. I., & Cistaro, P. A. (2009, April). Transforming safety culture: Grassroots-led/management-supported change at a major utility. *Professional Safety*, 28–35.

Taylor, J., & Taylor, S. (2008). Military human factors—Where are we now, where we might go. *Defence Aviation Safety Centre Journal*, 10–21.

Thompson, R. C., Hilton, T. F., & Witt, L. A. (1998, Spring). Where the safety rubber meets the shop floor: A confirmatory model of management influence on workplace safety. *Journal of Safety Research, 29*(1), 15–24.

U.S. Department of Labor, Occupational Safety and Health Administration. (n.d.) *OSHA voluntary protection programs (VPP)*. Retrieved May 21, 2009, from http://www.osha.gov/dcsp/vpp/index.html

Vecchio-Sudus, A. M., & Griffiths, S. (2004, August). Marketing strategies for enhancing safety culture. *Safety Science, 42*(7), 601–619.

Zohar, D. (1980, February). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology, 65*(1), 96–102.

Zohar, D. (2000, August). A group-level model of safety climate: Testing the effect of group climate on micro-accidents in manufacturing jobs. *Journal of Applied Psychology, 85*(4), 587–596.

Zohar, D. (2002a, February). Modifying supervisory practices to improve sub-unit safety: A leadership-based intervention model. *Journal of Applied Psychology, 87*(1), 156–163.

Zohar, D. (2002b). The effects of leadership dimensions, safety climate, and assigned priorities on minor injuries in work groups. *Journal of Organizational Behavior, 23*(1), 75–92.

Zohar, D., & Luria, G. (2003). The use of supervisory practices as leverage to increase safety behavior: A cross-level intervention model. *Journal of Safety Research, 34(*5), 567–577.

Zohar, D., & Luria, G. (2005). A multilevel model of safety climate: Cross-level relationships between organization and group-level climates. *Journal of Applied Psychology, 90*(4), 616−628.

Appendix A

Survey

Please circle the best answer to each survey item.

1. Which best describes you?
    1. Hourly
    2. Salaried

2. Which best describes you?
    1. Member of a grassroots team
    2. Member of the guidance team
    3. Neither

3. How many years have you been employed at NCRA?
    1. 0 to 5 years
    2. 6 to 10 years
    3. 11 to 20 years
    4. 20+ years

4. What unit best identifies where you work?
    1. Operations
    2. Maintenance
    3. Safety

5. I think the union and salaried employees are working together in the safety culture change efforts.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

6. Hourly employees show commitment to the safety culture change process.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

7. Management and supervisors show commitment to the safety culture change process.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

8. I understand my role in the overall safety culture change process.
   1. Not true
   2. Seldom true
   3. Occasionally true
   4. Mostly true
   5. Definitely true

9. I know what the guidance team and grassroots teams do.
   1. Not true
   2. Seldom true
   3. Occasionally true
   4. Mostly true
   5. Definitely true

10. The grassroots teams communicate the results of their safety culture change projects.
   1. Not true
   2. Seldom true
   3. Occasionally true
   4. Mostly true
   5. Definitely true

11. The guidance team regularly communicates the goals of the safety culture change process.
   1. Not true
   2. Seldom true
   3. Occasionally true
   4. Mostly true
   5. Definitely true

12. Management and supervisors regularly communicate the importance of safety culture in our daily work routines.
   1. Not true
   2. Seldom true
   3. Occasionally true
   4. Mostly true
   5. Definitely true

13. Management and supervision encourage employees to share safety concerns and report near misses.
   1. Not true
   2. Seldom true
   3. Occasionally true
   4. Mostly true
   5. Definitely true

14. Management and supervisors are on the same page when they talk about the safety culture change process.
1. Not true
2. Seldom true
3. Occasionally true
4. Mostly true
5. Definitely true

15. The grassroots teams' projects have made a difference in the safety of our employees.
1. Not true
2. Seldom true
3. Occasionally true
4. Mostly true
5. Definitely true

16. The guidance team projects have made a difference in the overall safety of the refinery.
1. Not true
2. Seldom true
3. Occasionally true
4. Mostly true
5. Definitely true

17. Management and supervision see the safety culture change as a strategic priority at NCRA.
1. Not true
2. Seldom true
3. Occasionally true
4. Mostly true
5. Definitely true

18. Our community expects safety to be our first priority.
1. Not true
2. Seldom true
3. Occasionally true
4. Mostly true
5. Definitely true

19. Supervisors and management share the same high level of commitment to the safety culture change process.
1. Not true
2. Seldom true
3. Occasionally true
4. Mostly true
5. Definitely true

20. Management and supervision believe safety is #1.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

21. Management and supervision share the same priorities when safety and production seem to be in conflict.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

22. Management and supervision share the same belief about what is acceptable and unacceptable risk levels.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

23. For the most part, I feel we are aligned as a work group/unit around the safety culture change process.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

24. Management and supervision take the time to address comments and concerns regarding the safety culture change process.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

25. The leadership focuses attention and resources on the safety culture change process.
    1. Not true
    2. Seldom true
    3. Occasionally true
    4. Mostly true
    5. Definitely true

26. The grassroots teams and guidance team structure supports the safety culture change process.
1. Not true
2. Seldom true
3. Occasionally true
4. Mostly true
5. Definitely true

Appendix B

Consent Form

Dear NCRA employee,

My name is Nicholas Krump, and I work with Culture Change Consultants aiming to create a premier culture of safety at NCRA. As a graduate student at Pepperdine University, I am interested in learning your perspectives on how we are doing in regard to creating a culture of safety. Specifically, the objectives of my research thesis are to determine:

1. the degree of leadership alignment for this initiative
2. what actions have contributed to creating leadership alignment
3. necessary actions to move towards stronger leadership alignment.

Specifics of the research include:

- The survey, focus groups, and interviews are voluntary.
- Your job status will not be affected whether you participate or not; you can choose to withdraw at any time.
- The data collected will remain anonymous. Your name will never be associated with any opinions.

If you have questions regarding the study, please contact Miriam Y. Lacey, Ph.D. at [contact information omitted].

If you would like to participate in helping us look at improving our safety culture, please sign below to show your consent.

Thank you,

Nicholas Krump

_____   _____
Participant's Signature   Date

_____
Participant's Printed Name