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# Review of the Literature Pertinent to the Evaluation of Safety Culture Interventions

## Technical Letter Report

**KM Branch  
JL Olson**

**December 2011**



**Pacific Northwest**  
NATIONAL LABORATORY

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Pacific Northwest National Laboratory  
Richland, Washington 99352

## **Abstract**

This report presents a review of social science literature pertinent to the interpretation of safety culture assessments and evaluation of corrective actions proposed to address shortcomings identified through the assessment process. It draws upon research conducted on high reliability organizations, individual and organizational change and intervention, and program evaluation to provide a framework for this interpretation and evaluation process. It summarizes how key safety culture and organizational effectiveness traits such as leadership, respectful work environment, personal accountability, and continuous learning are defined and discussed in the social science and safety culture literature and in the literature on establishing and maintaining learning, quality, and sustainable organizations. The review concludes with an outline of the key implications of this literature for the evaluation of safety culture interventions and a call for greater attention to the mechanisms by which organizations create, maintain, and strengthen their safety cultures and to the dynamic interaction of the traits comprising a safety culture.

## **Acknowledgements**

The PNNL project team gratefully acknowledges the guidance and assistance provided by Stephanie Morrow, Project Manager, DaBin Ki, and Valerie Barnes, all of the U.S. Nuclear Regulatory Commission (NRC) Office of Nuclear Regulatory Research. Virtually everyone who has worked in the safety culture area has experienced the paradox that something so obviously important can be so elusive to define and so challenging to assess. The clear thinking and encouragement provided by these individuals was instrumental to any progress made toward meeting that challenge. We appreciate the opportunity to review the very wide range of literature addressed in this report.

The accuracy of the information and the views presented in this report are the responsibility of the authors and do not necessarily represent the opinion of the NRC or of any particular individuals or licensees.

## Executive Summary

Although the nature and importance of safety culture have become increasingly clear, it is less clear how a particular organization can move from a condition of a weak safety culture to a condition of a strong, positive safety culture. For this reason, the United States Nuclear Regulatory Commission (NRC) established a project focused on understanding the process of safety culture improvement. Within this project, the NRC directed the Pacific Northwest National Laboratory (PNNL) team to review the safety culture and related literature in order to aid the NRC's Office of Nuclear Regulatory Research (RES) staff in developing a technical basis for the regulatory review of safety-culture assessment results as they relate to corrective action plans for safety culture weaknesses.

This report focuses on the literature pertinent to the evaluation of interventions designed to correct weaknesses in an organization's safety culture revealed through a safety culture assessment process. This is a broad mandate. To address it, the PNNL team conducted a search of the academic and professional literature and assembled an extensive bibliography on safety culture and safety climate. The PNNL team also searched and selectively reviewed related literature on high reliability organizations (HROs), resilience engineering, organizational culture, culture change, behavioral change, organizational change management, program evaluation, and the design of interventions. It also searched the social science literature for studies on and theories about the traits identified as key to an effective safety culture, for example, leadership, trust, accountability, and respect.

One of the primary conclusions from this review is that the literature does not clearly identify a singular model or approach for managing the process of safety culture improvement. There is no simple recipe for developing safety culture interventions or for assessing the likelihood that these interventions will have the desired effects. However, the literature does provide ample insight into the factors to take into account in designing and assessing safety culture interventions. This report provides a framework for a systematic consideration of those factors.

The framework presented in this report is based on a particular view of safety culture that is consistent with most of the relevant theoretical and empirical literature regarding organizational culture. Safety culture cannot be separated either logically or empirically from the dynamics of the broader organizational culture of which it is a part. The development of interventions intended to strengthen the cultural bases of safety performance in an organization, therefore, starts with an understanding of the basic characteristics of organizational culture.

The literature consistently emphasizes, and research demonstrates, that effecting directed behavioral, cognitive, or cultural change in adults and within established organizations is challenging and difficult, requires persistence and energy, and is frequently unsuccessful. Those who go beyond this caveat uniformly emphasize the importance of a sophisticated understanding of "why things are as they are" as an essential starting point in designing effective change strategies. This understanding needs to extend beyond the levels of culture that are readily observable to the deeper

levels that create the most powerful forces for perception and behavior and therefore also the most powerful barriers to change. The relevant levels of organizational culture include:

- artifacts – outward manifestations, symbols, written documents, stated (espoused) values, technology, etc.;
- behaviors – the day-to-day behaviors that reveal the values in action, the modes of interaction, and day-to-day practices;
- mindsets (ways of thinking) – the basic assumptions, mental models, beliefs, and organizing frameworks;
- emotional ground – the mostly unconscious emotional states and needs that drive actions and reactions; and
- motivational roots – the aspirations and motivations of the individuals, groups, and leaders who comprise the organization and their alignment or non-alignment with the basic aspirations and purpose of the organization.

These cultural levels interact in complex ways. Consequently, initiatives to change an organization's culture typically require coordinated intervention at each of these multiple levels. Safety culture intervention strategies are more likely to be effective if they:

- take a cultural approach that emphasizes identification and clarification of systems of meaning and behavior within patterns of relationships along with characterization of attitudes and espoused values;
- hold open the potential for there to be more than one coherent cultural system in an organization;
- specifically address how multiple subcultures relate to each other;
- attempt to understand safety culture within the broader organization rather than as a phenomenologically distinct entity;
- strive to understand how different aspects or traits relate to and influence one another; and
- recognize that some of the most powerful aspects of culture operate at the level of assumption, value, and belief and are neither readily visible through the observation of behaviors nor reliably described by individual reports.

A number of the traits the NRC and other organizations identify as essential elements of a positive safety culture are core dimensions of social interactions. These include trust, accountability, respect, and fairness/justness. Each of these dimensions represents an aspect of the relationships that individuals create as they interact with one another. Research shows that the status of these dimensions in organizations are correlated with one another—problems with one tend to be related to problems with all—and that they individually and collectively affect employee commitment, motivation, and behavior. The assumptions, perceptions, expectations, and attitudes individuals have about these dimensions of the social interactions in an organization, management's support and modeling of them, and subsequently, the norms established for them within the organization constitute important aspects of an organization's culture and social environment in general and its safety culture in particular. The status of these dimensions affects what interventions are needed and how those interventions need to be implemented in order to achieve a positive safety culture.

Most interventions to enhance safety culture imply changes in the behavior of individuals within the target organization. Research on individual behavioral change, particularly in the public health arena, has clarified the factors that affect individuals' intentions to act and their subsequent behaviors. Perceptions of social norms, one's capacity, and consequences are among these factors. Behavior change models based on this research, particularly the Integrated Behavioral Model, provide a framework for structuring both the design of interventions to achieve particular behaviors and the evaluation of proposed interventions. These models reflect accumulated evidence that to realize lasting behavioral change in individuals effective interventions must simultaneously address individual attitudes, motivations, and feelings of self efficacy—and, because these individual attributes are imbedded in the normative patterns that characterize the organization's culture—the normative patterns themselves.

Every directed change effort needs to be managed. This calls upon leadership, management, attention, effort, and communication skills. The organizational change management literature focuses primarily on approaches to assess the need for change and the organization's readiness for change; guidance for managers responsible for planning and implementing organizational change initiatives; and discussions of the consequences of organizational change management initiatives. The general guidance provided in much of this literature emphasizes the following essential elements of an effective change management approach:

- establish a sense of urgency;
- create the guiding coalition;
- develop a vision and strategy;
- communicate the change vision;
- empower employees for broad-based action;
- generate short-term wins;
- consolidate gains and producing more change; and
- anchor new approaches in the culture.

While this general guidance has substantial face validity, the high rate of failure in organizational change efforts suggests that the implementation of this general guidance is difficult for those tasked with this responsibility to fulfill.

Best practice in the design of interventions in the public health sector employs the technique of logic modeling. This approach has potential for organizing and evaluating plans and strategies for safety culture interventions. When done thoughtfully, preparing and annotating a logic model leads those designing an intervention to clarify their thinking, examine their assumptions, frames, and conceptual models, consider available resources, and articulate a rationale for the program's design. The resulting logic model and implementation plan, especially when accompanied with sufficiently detailed annotations, should provide sufficient information to demonstrate that each of the following elements has been, or will be, addressed thoroughly and appropriately:

1. Adequacy of the safety culture assessment to provide a clear understanding of the scope and nature of the problems, including where they are located in the organization and why they are occurring.
2. Identification of barriers to change and facilitators of change.

3. Clear model of required changes.
4. Realistic and informed approach to behavioral change.
5. Identification and review of previous change initiatives and programs.
6. Clear intervention design and implementation plan with adequate leadership and resource support.
7. Measurement and monitoring to verify that corrections have been made.
8. Follow-up to ensure that corrections have become embedded, the problems are not recurring, and no adverse effects need attention.

This documentation thus provides a basis for those evaluating the quality and appropriateness of the proposed intervention program to:

- examine the strength of the logic and program theory;
- assess whether the proposed activities address all the problems or weaknesses identified in the needs assessment (safety culture assessment);
- consider the adequacy of the proposed resources and the feasibility of the schedule;
- check that the program is tailored to the particular organizational context;
- confirm that the monitoring and evaluation plan will collect appropriate and valid data; and
- judge the overall adequacy and acceptability of the proposed intervention plan.

The logic models and intervention plans, in combination with the monitoring and evaluation data that are collected over the course of its implementation, provide a resource of information about the effectiveness of the intervention strategies that could be analyzed and used to inform subsequent safety culture assessment and corrective action efforts.



## Abbreviations

ACSNI: Advisory Committee on the Safety of Nuclear Installations  
CAPA: corrective action and preventive action  
CDC: Centers for Disease Control  
DOE: U.S. Department of Energy  
DOT: U.S. Department of Transportation  
ES&H: Environmental Safety and Health  
FDA: U.S. Food and Drug Administration  
FFD: fitness for duty  
HRO: high reliability organizations  
HSE: U.K. Health and Safety Executive  
IAEA: International Atomic Energy Agency  
INPO: Institute of Nuclear Power Operations  
ISO: International Organization for Standardization  
NEI: Nuclear Energy Institute  
NRC: U.S. Nuclear Regulatory Commission  
NSCA: Nuclear Safety Culture Assessment  
PNNL: Pacific Northwest National Laboratory  
RES: NRC Office of Nuclear Regulatory Research  
SCART: Safety Culture Assessment Review Team  
SMS: safety management system  
TQM: total quality management



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# 1 Introduction

In various ways, the NRC has been concerned with safety culture issues throughout its existence as a regulatory body. The term “safety culture” was first introduced to the nuclear industry as part of the International Atomic Energy Agency (IAEA) assessment of the causes of the Chernobyl accident (IAEA 1988). However, the NRC had recognized even before the Three Mile Island accident that aspects of a licensee’s<sup>1</sup> organization play an essential role in determining safety performance. Among the cultural aspects noted were the taken for granted assumptions about the inherent riskiness of nuclear power plant operations, the importance of technical expertise in assuring safety, and the forms of management and leadership most conducive to safe performance (Osborn et al. 1983; Marcus et al. 1990).

As the Chernobyl accident raised the level of concern with safety culture globally, the NRC began to take steps to address safety culture issues. The event at Davis Besse in 2002 led the NRC to consider whether and how it might encourage licensees to recognize and address deficiencies in safety culture (U.S. NRC 2004 (SECY-04-0111)). The Davis Besse event seemed to indicate that even when licensees had implemented standard safety management systems, issues of complacency, narrowly constrained mental models, and shortsighted decision making could lead plants to the point of potential failure. Such issues reflect deficiencies in the organization’s culture relative to assuring safety. At the Commission’s direction, the NRC staff initiated enhancements to the Reactor Oversight Process (ROP) to address safety culture, improvements to inspector training, and a more formal assessment of safety culture for licensees with degraded performance as evaluated within the ROP. NRC staff completed these activities in 2006 with crosscutting safety culture characteristics and aspects added to the ROP (U.S. NRC 2006b) and with the development of IP 95003, which contained guidance for conducting safety culture assessments (U.S. NRC 2011a).

On June 14, 2011, the Nuclear Regulatory Commission (NRC) published its Safety Culture Policy Statement (U.S. NRC 2011c). The publication of this policy statement follows several years of internal discussion as well as dialog with stakeholders concerning the definition of safety culture and the identification of the elements that comprise the concept. The policy statement clearly states the NRC’s conclusion that the organizational culture of each licensee, certificate holder and other regulated entity is of significant importance in assuring safe performance. This conclusion derives from analyses of several safety significant events, ongoing inspection efforts, and experience from other regulators and industries. The NRC’s assessment of the importance of safety culture leads to the expectation that all of its regulated entities will “... establish and maintain a positive safety culture commensurate with the safety and security significance of their activities and the nature and complexity of their organizations and functions (U.S. NRC 2011c:34777).” The regulated entities are to accomplish this goal by paying particular attention to the nine safety-culture traits identified and defined in the policy statement.

The NRC is continuing its dialog with industry and other stakeholders concerning how best to assess safety culture, as defined in the policy statement. Various modifications and elaborations

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<sup>1</sup> This report uses the term “licensees” as shorthand for the variety of NRC regulated entities. While a positive safety culture is important for all of these entities, the most focused and urgent concern has been with nuclear power plant licensees.

may result from this dialog. However, the NRC has identified an additional issue related to the assurance of a positive safety culture. This issue concerns how either the NRC or the regulated entity can be confident that actions designed to address any identified weaknesses in safety culture will have the desired effects.

While the nature and importance of safety culture have become increasingly clear, it is less clear how a particular organization can move from a condition of a weak safety culture to a condition of a strong, positive safety culture. For this reason, the NRC established a project focused on understanding the process of safety culture improvement. Within this project, the NRC directed the Pacific Northwest National Laboratory (PNNL) team to review the safety culture and related literature in order to aid the NRC's Office of Nuclear Regulatory Research (RES) staff in developing a technical basis for the regulatory review of safety-culture assessment results as they relate to corrective action plans for safety culture weaknesses.

This report focuses on the literature pertinent to the evaluation of interventions designed to correct weaknesses in an organization's safety culture revealed through a safety culture assessment process.<sup>2</sup> This is a broad mandate. To address it, the PNNL team conducted a search of the academic and professional literature and assembled an extensive bibliography on safety culture and safety climate. The PNNL team also searched and selectively reviewed related literatures on high reliability organizations (HROs), resilience engineering, organizational culture, culture change, behavioral change, organizational change management, program evaluation, and the design of interventions. It also searched the social science literature for studies on and theories about the traits identified as key to an effective safety culture, for example, leadership, trust, accountability, and respect.

One of the primary conclusions from this review is that the literature does not clearly identify a singular model or approach for managing the process of safety culture improvement. There is no simple recipe for developing safety culture interventions or for assessing the likelihood that these interventions will have the desired effects. However, the literature does provide ample insight into the factors to take into account in designing and assessing safety culture interventions. This report attempts to provide a framework for a systematic consideration of those factors

As described in Figure 1.1, the development of an effective framework for evaluating safety culture interventions depends on three important inputs:

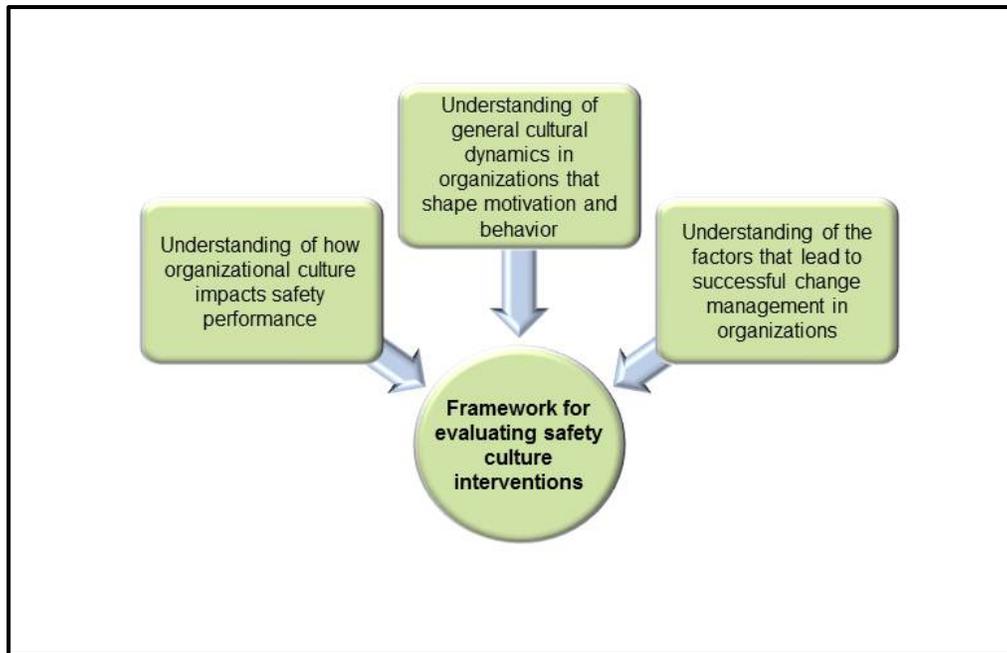
- an understanding of which aspects of an organization's culture impact safety performance and the mechanism by which these impacts are manifest;
- an understanding of the dynamics of organizational culture including the origins of norms, values and attitudes, as well as the specific normative patterns that must be present for organizations to operate effectively;<sup>3</sup> and

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<sup>2</sup> The Nuclear Energy Institute (NEI) is developing a methodology for safety culture assessment, *Fostering a Strong Nuclear Safety Culture* (NEI 09-07) and the Nuclear Safety Culture Assessment (NSCA) manual. See Branch and Olson (2011) for a review of this methodology.

<sup>3</sup> Hofstede (1991) and Hofstede et al. (1990) identified broad differences in these normative patterns among national cultures. However, within a particular national culture, there tends to be general agreement on the normative patterns that result in individuals perceiving the trust, fairness, and respect in relationships necessary to motivate accountability, compliance, and other behaviors important to an organization's goals including safety.

- an understanding of the means and methods for managing change in organizations, including the interventions necessary to effect change in the motivation and behavior of individuals.



**Figure 1.1.** Inputs for Evaluating Safety Culture Interventions

Ideally, an evaluator would understand the relationships illustrated in Figure 1.1. Unfortunately, as discussed in the remainder of this report, the current state of research and experience does not provide such definitive answers. However, it is sufficient to inform an evaluator’s judgments concerning the nature and sources of the problems as well as judgments about whether proposed interventions are:

- targeting the appropriate sets of people, structures, and processes;
- being implemented with an intensity, scope, depth, and duration that is commensurate with the nature and magnitude of the change to be accomplished; and
- providing adequate motivation for individuals to support the change effort and make the desired changes in behavior.

It is also sufficient to enable informed judgments concerning the change management process itself, including the need for and likely provision of leadership commitment and reinforcement. Consequently, it can make a real contribution to informed evaluation of proposed interventions.

Following this introduction, Chapter 2 provides background on the concept and measurement of safety culture and identifies the specific issues addressed in this report. Chapter 3 describes some of the building blocks of organizational culture and the bases of cultural change within organizations. Chapter 4 provides an overview of the literature on individual, group, and organizational change including a summary of major organizational change theories. This section pays particular attention to an integrated behavioral model that illustrates the factors that influence individual behavior because these are the factors that intervention programs need to

change in order to elicit desired behaviors. Chapter 5 reviews literature on other types of high performance organizations and discusses lessons learned from initiatives to build and sustain learning, quality, and sustainability cultures within these organizations. Chapter 6 discusses approaches to the design, planning, and evaluation of interventions, with a focus on program theory driven evaluation and the use of logic models. Chapter 7 presents implications and conclusions. Chapter 8 is a list of references cited in the report. Appendix A provides a brief summary of some of the guides and tailored approaches to building or improving an organizational safety culture.

## 2 The Concept of Safety Culture

An important step in the development of a framework for evaluating safety culture intervention strategies is identifying the aspects of an organization's culture that are important determinants of safety, and to the extent possible, the specific mechanism whereby these aspects affect safety-related outcomes. The objectives of this chapter are to review how safety culture is addressed in the literature, to identify some gaps in the literature relative to a complete understanding of safety culture, and to tentatively suggest some priorities and lessons learned for evaluators of proposed safety culture interventions.

### 2.1 Definition and Traits

The NRC Safety Culture Policy Statement identifies and defines a list of traits characterizing a strong safety culture. This list is derived from a review of the safety culture literature, insights and practices from other industries and associated regulatory bodies, input from the NRC's licensees and other stakeholders, as well as NRC staff expertise and experience relative to the organizational determinants of safe and secure operation.<sup>4</sup> The definition of safety culture adopted in the policy statement is:

“...[C]ulture may be defined best at macro, ecological, and societal levels in terms of values (general goal states) and practices (behavioral routines often designed to achieve the values) that are collectively distributed and, to some important extent, shared” (Kitayama and Uskul 2011:421).

Nuclear Safety Culture is defined as the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment.”

The list of traits further defining safety culture in the NRC policy statement includes:

- Leadership Safety Values and Actions – Leaders demonstrate a commitment to safety in their decisions and behaviors.
- Problem Identification and Resolution – Issues potentially impacting safety are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance.
- Personal Accountability – All individuals take personal responsibility for safety.
- Work Processes – The process of planning and controlling work activities is implemented so that safety is maintained.
- Continuous Learning – Opportunities to learn about ways to ensure safety are sought out and implemented.
- Environment for Raising Concerns – A safety conscious work environment is maintained where personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment, or discrimination.
- Effective Safety Communication – Communications maintain a focus on safety.
- Respectful Work Environment – Trust and respect permeate the organization.

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<sup>4</sup> This is a trait-based model of organizational culture. For a discussion of trait theory, see McCrae and Costa (1997).

- Questioning Attitude – Individuals avoid complacency and continuously challenge existing conditions and activities in order to identify discrepancies that might result in error or inappropriate action.

These traits define the minimum areas of concern, according to the policy statement, that each licensee must address. Consistent with the policy statement, a major concern of the safety culture literature has been to specify the traits that comprise an organization’s safety culture, develop, and evaluate the properties of the instruments to measure them, and examine the relationship between safety culture and safety performance.<sup>5</sup> Other organizations, including the Nuclear Energy Institute (NEI) and the Institute of Nuclear Power Operations (INPO 2004), the International Atomic Energy Agency’s Safety Culture Assessment Review Team (IAEA/SCART 2002a,b), the U.S. Department of Energy (DOE 2006), and the United Kingdom’s Health and Safety Executive (UK HSE in Human Engineering 2005a,b), have elaborated similar definitions and lists of traits as illustrated in Table 2.1.

**Table 2.1. Safety Culture Definitions and Traits**

	<b>NRC</b>	<b>NEI/INPO</b>	<b>IAEA/SCART</b>	<b>DOE</b>	<b>UK HSE</b>
<b>Definition of Safety Culture</b>	Nuclear Safety Culture is the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment	An organization’s values and behaviors—modeled by its leaders and internalized by its members—that serve to make nuclear safety the overriding priority	Safety culture is the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance	Organizations with a positive safety culture are characterized by communications founded on mutual trust, shared perceptions on the importance of safety and by confidence in the efficacy of preventive measures	The safety culture of an organization could be described as the ideas and beliefs that all members of the organization share about risk, accidents, and ill health
<b>Key Dimensions of Safety Culture</b>	Leadership Safety Values and Actions Problem Identification and Resolution Personal Accountability Work Processes Continuous Learning Environment for Raising Concerns Effective Safety Communications Respectful Work Environment Questioning Attitude	Everyone is personally responsible for nuclear safety Leaders demonstrate commitment to safety Trust permeates the organization Decision making reflects safety first Nuclear technology is recognized as special and unique A questioning attitude is cultivated Organizational learning is embraced Nuclear safety undergoes constant examination	Safety is a clearly recognized value Leadership for safety is clear Accountability for safety is clear Safety is integrated into all activities Safety is learning driven	Leadership (engagement, conservative decision making, open communication, etc.) Employee/Worker Engagement (personal commitment, teamwork, and mutual respect, etc.) Organizational Learning (questioning attitude, trust, use of operational experience, etc.)	Visible commitment to safety by management Workforce participation and ownership of safety problems and solutions Trust between shop floor and management A competent workforce

<sup>5</sup> The most common measures of safety culture depend on questionnaire surveys to assess both safety culture and safety climate. Respondents report on their perceptions and evaluations of aspects of safety culture/climate and the survey data are analyzed with factor analytic or similar techniques to identify underlying dimensions of safety culture.

Although there is not perfect agreement across different organizations about essential traits, substantial overlap exists, as shown in Table 2.1. For example, each approach emphasizes the importance of leadership and personal accountability/involvement in assuring safety. There is also general support for the importance of learning as part of a safety culture, and a shared emphasis on the need for an atmosphere of trust and respect. However, considerable additional effort is still needed to identify the mechanisms that link these traits to safety outcomes and to clarify how the interaction patterns among them.

Despite the considerable effort given to identification of safety culture traits, numerous gaps in the research literature concerning safety culture remain. For example, studies have only recently begun to focus on clarifying the relationships among those traits and their relative roles in safety performance. Few studies have examined the effects of other organizational and individual attributes on efforts to establish, maintain, and improve an organization's safety culture. Most of the literature on "correcting" identified weaknesses in or "strengthening" an organization's safety culture is general. Few authors articulate the theoretical basis of their recommendations or discuss ways to accomplish improvements in a particular trait. Little consideration is typically given to the dynamic interactions among the traits or with the broader organizational culture (Conchie and Donald 2008; Zhang et al. 2011). This lack of specificity about the interrelationships among the core safety culture traits and the mechanisms that establish those relationships makes the design of effective intervention programs considerably more difficult.

## **2.2 Perspectives on Safety Culture**

Moving beyond the list of traits to understand the dynamics of safety culture more fully requires a consideration of the different theoretical orientations or perspectives that exist in the literature. As noted throughout the research literature, culture, organizational culture, and safety culture are complex, abstract concepts whose appropriate definitions, measurement, dimensions, and units of analysis have been, and continue to be, much discussed and debated within and between the various disciplines studying culture and safety: anthropology, sociology, psychology, management, and to a lesser degree safety engineering. Indeed, a substantial portion of the literature is devoted to discussion of these issues of definition and measurement and therefore how the concept of culture can best be applied in the design and management of organizations. Although informed by these discussions, this review does not attempt to summarize this debate.<sup>6</sup>

### **2.2.1 Dimensions and Levels of Organizational Culture**

The literature consistently emphasizes that effecting directed behavioral, cognitive, or cultural change in adults and within established organizations is challenging and difficult, requires persistence and energy, and is frequently unsuccessful.<sup>7</sup> Those who go beyond this caveat

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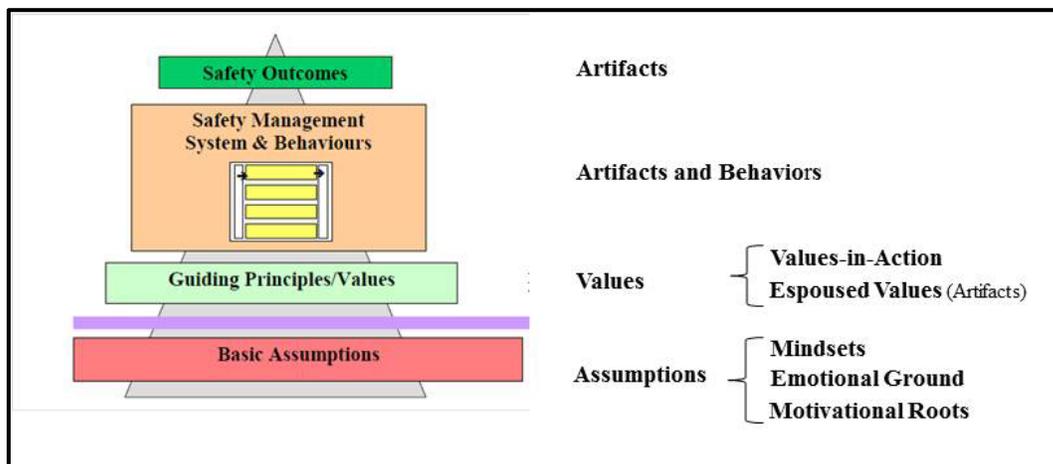
<sup>6</sup> The concept of organizational culture emerged in the 1940s from the human relations perspective of organizations. In this perspective, an organization's informal, nonmaterial, and moral bases of cooperation and commitment were as, or perhaps more, important than its formal, material, and instrumental controls. During the late 1970s and through the 1980s the focus shifted to the effect of culture on organizational performance and the processes by which organizational cultures are created, maintained, and changed. This led to the conceptualization of organizational culture as a competitive asset to be manipulated and managed rather than as a natural, organically emergent phenomenon (Denison et al. 1990; Baker 2003a; Schein 2010).

<sup>7</sup> Although there are few rigorous assessments of planned organizational change initiatives, estimates of the failure rate of such efforts generally range from 50-75 percent, with those involving culture change failing at even higher rates (Hale et al. 2010a).

uniformly emphasize the importance of a sophisticated understanding of “why things are as they are” as an essential starting point in designing effective change strategies. This understanding needs to extend beyond the levels of culture that are readily observable in an organization to the deeper levels that create the most powerful forces for perception and behavior and therefore also the most powerful barriers to change. The levels (adapted from Schein 2010) are:

- artifacts - outward manifestations, symbols, written documents, stated (espoused) values, technology, etc.;
- behaviors - the day-to-day behaviors that reveal the values in action, the modes of interaction, and day-to-day practices;
- mindsets (ways of thinking) - the basic assumptions, mental models, beliefs, and organizing frameworks;
- emotional ground - the mostly unconscious emotional states and needs that drive actions and reactions; and
- motivational roots - the aspirations and motivations of the individuals, groups, and leaders who comprise the organization and their alignment or non-alignment with the basic aspirations and purpose of the organization.

Figure 2.1 illustrates how this framework applies to safety culture.



Source: Adapted from NEA/CSNI (2006)

**Figure 2.1.** Schein’s Model of Organizational Culture Applied to Safety

These levels interact with and reinforce one another over time (Kitayama and Uskul 2011). Understanding how things are in terms of artifacts and behaviors, and why they are as they are, in terms of mindsets, emotions, and motivations, is an essential purpose of a cultural assessment. It is also the reason, as discussed below, that cultural assessments and interventions must guard against oversimplifications that prevent acquisition of this sophisticated understanding of the less visible aspects of the culture and their relationship to individual behaviors and organizational performance. Put simply, unless the assessment is capable of

characterizing each of the levels of culture, interventions derived from the assessment are likely to be incomplete or misdirected.<sup>8</sup>

Given these challenges, one conclusion is that the most useful literature on safety culture and its assessment and improvement:

- attempts to understand safety culture within the broader organization rather than as a phenomenologically distinct entity;
- takes a cultural approach that emphasizes identification and clarification of systems of meaning and behavior within patterns of relationships along with characterization of attitudes and espoused values;
- recognizes that some of the most powerful aspects of culture operate at the level of assumption, value, and belief and are neither readily visible through the observation of behaviors nor reliably described by individual self-reports;
- holds open the potential for there to be more than one coherent cultural system in an organization;
- specifically addresses how multiple subcultures relate to each other; and
- strives to understand how different aspects or traits relate to and influence one another.

What this means is that an effective assessment needs to go beyond comparisons of a culture to a specified set of idealized traits. An effective assessment should dig deeply, through probing interviews and careful observations, to investigate why the traits are as they are, how the observed aspects/traits relate to and influence one another, and where there are gaps, mismatches, and inconsistencies that indicate lack of alignment and divergences.

## **2.2.2 Alternative Models of Safety Culture**

Schein's (2010) *Organizational Culture and Leadership* provides one of the most focused, detailed, and complete discussions of planned and directed organizational culture change identified in the literature. In it, he emphasizes that cultural assessments and planned cultural change should be undertaken only when necessary to support an organizational change effort needed to address a problem facing the organization or to meet a new organizational goal. In other words, the purpose of changing the culture is to make the organization more effective, not to make the culture conform to some specification or attribute. "The change goal must be defined concretely in terms of the specific problem you are trying to fix, not as 'culture change'" (Schein 2010:311).

According to Schein's conceptual model, an organization's safety culture is that subset of the organization's culture that affects its ability to achieve and maintain safe operations. Both the safety culture and the organization's culture must be in alignment with the strategy of the organization if it is to operate successfully within its environment (Wilkins and Dyer 1988). The purpose of a safety culture assessment is to identify and understand that subset of the organization's culture that affects safety and safe operations. The purpose of a safety culture intervention is to further the organization's ability to achieve and maintain safe operations.

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<sup>8</sup> For a more detailed discussion of the safety culture assessment methodology proposed by the NEI, see *Independent Review of Revision 0 of NEI 09-07 and Related Experience* (Branch and Olson 2011).

Consequently, both may require investigating and changing aspects of the organization's culture that extend beyond those specified in the literature as "safety culture traits."<sup>9</sup>

Another substantial subset of the literature on safety culture reflects a very different conceptual model. In this model, the focus is on:

- specifying the dimensions and attributes of an "ideal" or "good" safety culture;
- developing instruments to measure the extent to which individuals within the organization report the presence of those dimensions and attributes;
- conducting assessments to determine how closely the safety culture of the organization replicates that ideal; and
- designing interventions to "fix" the existing culture so that it corresponds with that ideal.<sup>10</sup>

Researchers applying this conceptual model have focused on quantitative examinations of the relationship between "safety culture" and safety performance as part of the process of validating the attributes and dimensions of the "ideal" safety culture and the relative contribution of different dimensions to improved safety (Joe and Persensky 2010; Yang et al. 2010). Cooper (2001), Hale et al. (2010b), Hudson (2007), Lee and Harrison (2000), and others employ this conceptual model. The NEI approach reflects this conceptual model, and much of the work on safety culture in the healthcare and medical arenas applies it as well (DuPree et al. 2009; Katz-Navon et al. 2005). This approach has taken on the difficult task, not addressed by Schien or the HRO or resiliency literature, of specifying a method for measuring and assessing the relative status of an organization's safety culture. To do this, it has specified a set of traits that constitute safety culture and focuses the assessment on those traits. This approach enables a greater level of specificity and rigor in the assessment; however, by focusing so closely on a specified set of traits it also introduces the possibility that important cultural or other organizational factors that are indirectly affecting the safety culture and safety performance of the organization may be overlooked.

Hale (2000), Hopkins (2002, 2006), Hudson (1999, 2007), and Reason (1997) suggest a conceptual model that bridges the gap between the Schein approach and the ideal safety culture approach. They argue that in some organizations, cultural influences on safety are sufficiently strong to warrant consideration as a culture of safety within the organization. Indeed, Reason (1998) points out that only culture can have the pervasive effect needed to address safety. In this perspective, the focus is on the culture of the organization as a whole, with those elements supporting safety and safe operations addressed as integral to the organization's culture rather than as a separate, isolatable construct.<sup>11</sup> In a sense, this is the framework used to describe and study high reliability organizations (HRO) from a cultural perspective. For example, Sutcliffe (2011:137) emphasizes the importance of looking at cultural attributes and

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<sup>9</sup> Hopkins (2006:878) points out that this conceptual model, and the methods it typically applies, are more likely to apply an anthropological approach, for example, to gather information about how the organization's members solve problems (Schein 1992:187) or how they respond to problems and opportunities (Westrum 2004:ii22) than to employ Likert-scale response surveys. Hopkin's (2002, 2006) focus is primarily on how to assess organizational culture and use this information in designing an intervention.

<sup>10</sup> This is particularly true of studies reflecting a structural/functional rather than a critical realistic or interpretive/semiotic perspective (Naevestad 2010; Glendon and Stanton 2000; Cameron and Quinn 2006). This conceptual approach is similar to that advocated by Ouchi (1981) regarding an "ideal" Theory Z culture.

<sup>11</sup> Reason considers these elements cultures in themselves, and identifies them as an informed culture, which depends upon an effective reporting culture underpinned by a just culture. It also requires a flexible culture and a learning culture.

traits as they interact and function within an organizational system, not as separable or independent items. She also emphasizes the importance of recognizing that HROs must also be high-performing organizations and display traits such as “outstanding technology and task and work design, highly trained personnel, continuous training, effective reward systems, frequent process audits, and continuous improvement efforts” that are ubiquitous in such organizations.

### **2.2.3 An Integrated Perspective from the Literature on High Reliability Organizations**

Examination of organizations that successfully meet the challenges of operating in high-risk environments, often referred to as high reliability organizations (HROs), provides a conceptual model that considers safety-related attributes/traits at an organizational level (see particularly Perin 2005; Sutcliffe 2011; Weick and Sutcliffe 2001, 2007). This literature focuses on the patterns, modes of thinking, and bases of relationships among organizational participants that result in a particular type of performance.

The HRO researchers have identified a short list of deeply held assumptions that, when played out through behaviors and the structures that shape behaviors, determine whether an organization is reliable or not. This research community, particularly Weick and Sutcliffe, emphasize the central function of mindfulness in managing and conducting work in HROs, which includes being continuously aware of the potential for danger and failure, and being mindful regarding both the anticipation and containment of risk. The priority focus of these researchers when describing HRO organizations is on continuous cognizance and respect for risk and the potential for failure rather than on the achievement of safety.

Sutcliffe (2011:137) notes that HROs are distinctive because of their efforts to organize in ways that increase the quality of attention across the organization, enhancing alertness and awareness of details to enable detection of the subtle signs of variances that require response. This pattern is called “mindful organizing” (Sutcliffe 2011; Weick 2011; Weick and Sutcliffe 2006; Weick et al. 1999;). Mindful organizing maintains a dual focus on the anticipation and prevention of risks/dangers (through mechanisms such as detailed operating procedures, contingency plans, rules, protocols, and guidelines) and on resilience,<sup>12</sup> in recognition that “reliability is not the outcome of organizational invariance, but rather, results from a continuous management of fluctuations” (Sutcliffe 2011:136). Mindful organizing, and mindfulness by organizational participants, encourages awareness of the organization’s multiple interrelated systems and cognizance of how tasks and activities fit into and can affect them. Mindfulness of risk and the potential for failure and a systems perspective are key attributes of the culture of reliable, resilient organizations.

### **2.2.4 Key Social Dimensions and Traits of Highly Reliable Organizations**

Although the HRO literature has not focused on the identification and measurement of traits, descriptions of HROs tend to identify the following common features.

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<sup>12</sup> According to the HRO perspective, resilience results from three abilities:

- an ability to absorb strain and preserve functioning despite the presence of adversity
- an ability to recover or bounce back from untoward events
- an ability to learn and grow from previous episodes of resilient action.

## **Leadership**

Authority exists in every organization. A key role of leaders is providing clarity about the distribution of authority and promoting dialogue to ensure that authority is used to accomplish the organization's goals. Leadership behavior that evokes and warrants trust is an essential characteristic of a sense making and mindful organization. Ensuring that the organization's structures and processes enable and support safe behaviors is also an important leadership responsibility. As Schein (1992) and Dov (2008) emphasize, organizational priorities emanate from the core values and beliefs of senior management and other key leaders, which provide the antecedents of organizational policies and practices that inevitably influence the organization's culture. However, there are limits on leaders' ability to shape an organization's culture (Schein 2010; Tsui et al. 2006).

## **Mindful Organizing and Mindfulness**

Mindful organizing establishes the structures, processes, practices, and social context in which individuals can interact continuously and build, refine, and update a shared understanding of the situation and their capabilities. HROs "focus on building a group and organizational culture, where it is the norm for people to respectfully interact"... and a culture in which people "interrelate heedfully so that they become more consciously aware of how their work fits in with the work of others, and to the goals of the system." HROs also establish a set of practices to track small failures and to resist oversimplification of what they face. (Sutcliffe 2011:137).

## **Sense Making and Learning**

Sense making and learning involve the widely held and continually reinforced belief that risk can and should be reduced by learning from experience and taking appropriate action. The organization's members participate in an ongoing sense making process that has seven properties (Weick 1995):

1. Identity and identification are central (who people think they are in their context/culture).
2. Retrospection provides the opportunity for sense making.
3. The dialogues and narratives people create help them understand what they think.
4. Sense making is a social activity.
5. Sense making is ongoing.
6. People extract cues from the context to help them decide what information is relevant and what explanations are plausible.
7. People favor plausibility over accuracy in accounts of events and contexts identified.

## **Respectful Interaction and Heedful Interrelating**

Sutcliffe (2011:138) emphasizes the importance of respectful interaction and heedful interrelating to create the communication, exchange of information, and learning necessary in HROs. Heedful interrelating is "a social process through which individual action contributes to a larger pattern of shared action and in which individuals understand how their actions fit into the larger action" (system perspective). Another recommendation is to encourage individuals to develop "conceptual slack"—a divergence in team members' analytical perspectives and a willingness to question what is happening, rather than feigning understanding.

## **Trustworthiness and Trust**

The widely held and continually reinforced belief that other members of the organization can be trusted to conform to espoused norms and commitments and to do their jobs professionally is an attribute of HROs. Trust is closely related to what Reason (1997) terms a “just culture” in which the organization has effectively negotiated a distinction between culpable (and unacceptable) and non-culpable (and acceptable) behaviors and implemented processes to address events accordingly. Reason points out that this basis of just judgment is a prerequisite for trust, which itself is a prerequisite for the kind of reporting and learning that is another characteristic of HROs.

## **Recognition of Risk**

This concept entails the widely held and continually reinforced belief that the organization is engaged in risky activities and that therefore constant vigilance and conformity to safety practices is essential. Weick and Sutcliffe (2007) point out that safe operations require managing and working with mindfulness in both the anticipation and containment of risks. Mindfulness entails deliberative as opposed to automatic processing of information (DiMaggio 1997), allowing thoughtful retrieval and application of schemas, categories, and mental models. An important attribute of HROs is a culture that emphasizes the need for continual, deliberative attention to system conditions and a continuing awareness by every individual (manager and worker) that:

- this job/industry is risky;
- it is a system, and I am operating in a system;
- my decisions and actions make a difference; and
- attention and learning are continually important.

## **System Perspective**

Safety is a consequence of the reliability of the organization as a whole, which is a consequence of the reliability of the organizational processes (Hofmann et al. 1995). To maintain system reliability, operators need a system perspective and an awareness of system status. Control actions taken without consideration of the consequences on the system as a whole or based on a mistaken understanding of system status can create or worsen an incident or accident (Stanton et al. 2001). A system perspective is also necessary for effective communication of safety information—without it individuals do not know what information needs to be provided or to whom and how it should be communicated.

### **2.2.5 Summary and Integration**

Table 2.2 reflects the research on HROs, resilience engineering, and safety culture and summarizes what the project team believes are the elements of organizational culture that are most important for safety. The items in the first column reflect organizational culture at the level of assumptions and values, with the caveat that the literature does not support specification of a singular list of cultural assumptions and values essential to safe operations. The second column in Table 2.2 identifies the conceptual relationships among these cultural assumptions and values and some potential moderators and mediators that affect their impact on safety. The third column identifies some of the specific mechanisms linking these assumptions and values to safety. It is the project team’s position that this table identifies attributes of organizational culture that a safety culture assessment methodology should be able to characterize. This characterization should include information about how these attributes are linked and how they

interact within the organization. This information is needed to support development of interventions that are effective and do not cause unintended adverse consequences, including adverse impacts on organizational commitment, employee morale, and organizational citizenship behaviors (Armenakis and Bedeian 1999). Consequently, it is the project team's position that a proposed intervention that does not consider these elements is unlikely to capture and improve the cultural basis for safety in an organization.

**Table 2.2.** Cultural Assumptions Important to Safety in Nuclear Power Plants

<b>Widely Held and Continually Reinforced Beliefs</b>	<b>Prerequisites and Consequences</b>	<b>Rationale</b>
<b>Trust:</b> Leaders and other members of the organization can be trusted to conform to espoused norms and commitments.	<ul style="list-style-type: none"> <li>• Environment for raising concerns</li> <li>• Safety communication</li> <li>• Leadership (rewarding openness; showing respect; fair/just)</li> </ul>	Without trust there will not be a free flow of information, which is necessary to identify and resolve problems and to conduct work activities safely. Lack of trust decreases staff motivation to comply with safety requirements and contribute proactively to safety improvement.
<b>Cognizance of Risk:</b> The organization is engaged in risky activities and that constant vigilance and conformity to safety practices is essential.	<ul style="list-style-type: none"> <li>• Personal responsibility</li> <li>• Safety communication</li> <li>• Nuclear technology is special and unique</li> <li>• Leadership (resourcing; decision making)</li> </ul>	If not constantly reminded that the job involves risks, individuals' focus on safety will wane. If others, particularly managers, supervisors, and informal leaders, behave or speak in ways that communicate lack of concern with risk, the belief that the job contains risks will wane.
<b>Personal Efficacy:</b> Individual behaviors make a difference and efforts to maintain or improve safety can have the intended effects	<ul style="list-style-type: none"> <li>• Personal responsibility /accountability</li> <li>• Respect for others</li> <li>• Valuing expertise</li> <li>• Work processes</li> <li>• Systems perspective</li> </ul>	If individuals do not believe their efforts to support a strong safety culture and positive safety outcomes make a difference, they will not invest the energy and take the personal risks required to achieve these impacts. If individuals believe the organization does not invest in the training, analytic tools, and information sharing to support personal efficacy, individuals may feel powerless to contribute.
<b>Learning:</b> Risk is reduced by learning from experience and taking appropriate action.	<ul style="list-style-type: none"> <li>• Continuous improvement</li> <li>• Problem identification</li> <li>• Questioning attitude</li> <li>• Safety communication</li> <li>• Teamwork</li> <li>• Personal responsibility /accountability</li> </ul>	Nuclear power plants are dynamic environments resulting from such factors as plant aging, the introduction of new technology, workforce turnover, business drivers, and cascading causes and effects within a complex, interdependent system. Unless the organization continuously learns from operating experience, best practice in management and training, and advances in science and engineering, it cannot maintain safety in the face of this dynamism.

Widely Held and Continually Reinforced Beliefs	Prerequisites and Consequences	Rationale
<b>Safety First:</b> Safety is the most important objective when faced with decisions and alternatives	<ul style="list-style-type: none"> <li>• Decision making</li> <li>• Work processes</li> <li>• Leadership (modeling behavior)</li> </ul>	Unless safety is taken into account continuously and visibly in making decisions, communicating through this behavior that safety is never put at risk in favor of other goals, the ability to maintain compliance with high safety standards and best practices is jeopardized.
<b>Teamwork:</b> By operating as a team the organization can reduce risk and solve and mitigate problems.	<ul style="list-style-type: none"> <li>• Valuing expertise</li> <li>• Respect for others</li> <li>• Safety communication</li> <li>• Leadership (showing respect; rewards and recognition)</li> </ul>	Nuclear power plants are designed with numerous task interdependencies that require teamwork; early identification and resolution of problems requires the integration of different areas of expertise to yield a robust solution.
<b>Systems Perspective:</b> Each individual is operating within a system; what one person or group does impacts others and the system as a whole.	<ul style="list-style-type: none"> <li>• Personal responsibility/ accountability</li> <li>• Teamwork</li> <li>• Respect for others</li> <li>• Work processes</li> </ul>	Nuclear power plants are complex, interconnected systems where the maintenance of a safe operating margin depends on close coordination and collaboration. Unless staff maintains a mental model of how their behaviors can impact the system, they will be prone to errors of omission and commission.

Comparison of Tables 2.1 and 2.2 reveal that the traits reflected in the NRC’s safety culture policy and other key safety culture descriptions are generally consistent with the dimensions abstracted from the HRO literature. However, the HRO literature, and Table 2.2, goes beyond Table 2.1 in two important respects, both of which are important for the design of safety culture interventions:

- Table 2.2 identifies some of the specific mechanisms that link elements of a culture to safety outcomes.
- Table 2.2 begins to identify important relationships among the cultural elements.

The chapters that follow reflect this perspective on safety culture. They build a basis for interpreting the results of a safety culture assessment and evaluating the likely effectiveness of proposed interventions in making changes that will correct identified safety culture deficiencies and weaknesses. They also outline an approach for the development and presentation of intervention plans that facilitate this evaluation.



### 3 The Building Blocks of Culture and the Bases of Cultural Change

This section presents an overview of some of the concepts, constructs, and variables that are the building blocks of culture and, therefore, the bases of cultural change. It highlights areas that correspond to the NRC safety culture traits. Despite the variations in the definition of culture, there is general agreement that an organization's culture emerges from, and is manifest in, the interplay of its members' emotions, cognitions, attitudes, behaviors, interaction patterns, and sense making. Consequently, if an organization wants to change its culture, it needs to understand which of these building blocks should be changed and how to make and sustain that change.

A fundamental concept regarding organizations, organizational culture, and organizational change is that social organizations develop and establish their culture as individuals interact, create ongoing relationships, and form patterns of social ordering that become infused with shared meanings. Consequently, although organizations and cultures have traits that are distinct from those of individuals and groups, they can never be completely separated from them. Each level of social ordering (for example, individuals, work groups, formal organizations) has distinct properties that are not present in the entities of which it is comprised. Cultures are outgrowths of the social activities (i.e., activities involving groups of people) and communications about the meanings of those activities that provide participants with shared interpretations of social and organizational life, role expectations, common definitions of situations, and social norms (Olsen 1978:8, 108).

#### 3.1 Social Structures and Processes

“The networks of social relations between individuals and groups, and the status structure defined by them, constitute the core of the social organization of a collectivity, but not the whole of it” (Blau and Scott 2003:4). Shared beliefs and orientations, which emerge from social interactions, are the other main dimension of social organization. They establish expectations and norms for social participation and conduct. The process of social interaction leads to common notions about how people should behave and interact, what goals are worth striving for and attaining, and the emergence of common values and social norms. Once established, people exert social sanctions to discourage violations of these norms and often resist efforts to modify or change them. These two dimensions of social organization—the networks of social relations and the shared orientations—are often referred to as social structure and culture, respectively” (Blau and Scott 2003:4). Because social structures and processes shape how people interact, information about them is relevant for assessing and understanding a culture as well as for designing and implementing interventions.

“The conditions necessary for sustaining social order are several: the construction of trust and solidarity...; the regulation of power and the overcoming of the feelings of exploitation...; and the provision of meaning and of legitimation to the different social activities....” (Eisenstadt 1995:311).

### 3.1.1 Overview

Social structures<sup>13</sup> distribute resources (often unequally) through social processes. Individuals interact with one another within the context of social structures. Social interaction is a process in which the behaviors of an individual (or individuals) influence the behaviors of one or more others. Individual behavior is influenced by social structures and processes and by the individual's consideration of the actual or anticipated responses of others (Stets and Turner 2008:33.) In organizations such as nuclear power plants, structure typically refers to formal organizational arrangements that establish roles and define the relationships among roles. However, in every organization, informal structures created by the interactions of the organization's members always supplement the formally specified structures of the organization.

Social relations involve patterns of social interaction. Social interaction is recursive, that is, social interactions feed back to and affect emotional arousal, cognitions, social structure, and culture. "Culture and social structure are reproduced or potentially changed by the cognitions and emotions that emerge during the course of interactions among individuals" (Stets and Turner 2008:33). For example, once status differences are established, expectations can develop about the relative competence and performance of those at different levels in the status order. These expectations can become codified into cultural beliefs about the relative qualities of those who hold those status positions (Stets and Turner 2008). This can affect the interactions between individuals who perceive a status difference between themselves, as Perin (2005) found in her examination of a failure of safety communication and problem analysis at a nuclear power plant. In fact, it could be anticipated that one of the main modes of "safety culture failure" in a nuclear power plant is when status differences give rise to lack of trust, professional respect, or ease of communication among plant functions or hierarchical levels, thereby interfering with the free flow of safety-relevant information.

Social organization refers to the ways people become socially organized and exhibit regularities in behavior that are due to the social context rather than their physiological or psychological characteristics as individuals (Blau and Scott 2003:2). Social organizations—such as corporations—and the structures and processes that define them, have emergent properties that are irreducible to those of their constituent parts (Likert 1961; Mayo 1945; McGregor 1966, 1960; Meyer and Rowan 1977:340; Morgan 1997; Trist 1981; Tsoukas 2000:30; Wheatley 1992).<sup>14</sup> In addition, as individuals in formal organizations interact with one another, they create complex informal structures and processes that reflect enacted practices, values, norms, and social relations (Blau and Scott 2003:6). Several of the NRC safety culture traits represent particular manifestations of social structures and processes within formal organizations, as discussed below.

Considerable attention has been given to the optimal organizational structure and work process design for high-reliability process industries, which need a high degree of specialization at the individual and work-group level. The need for adherence to requirements and procedures during

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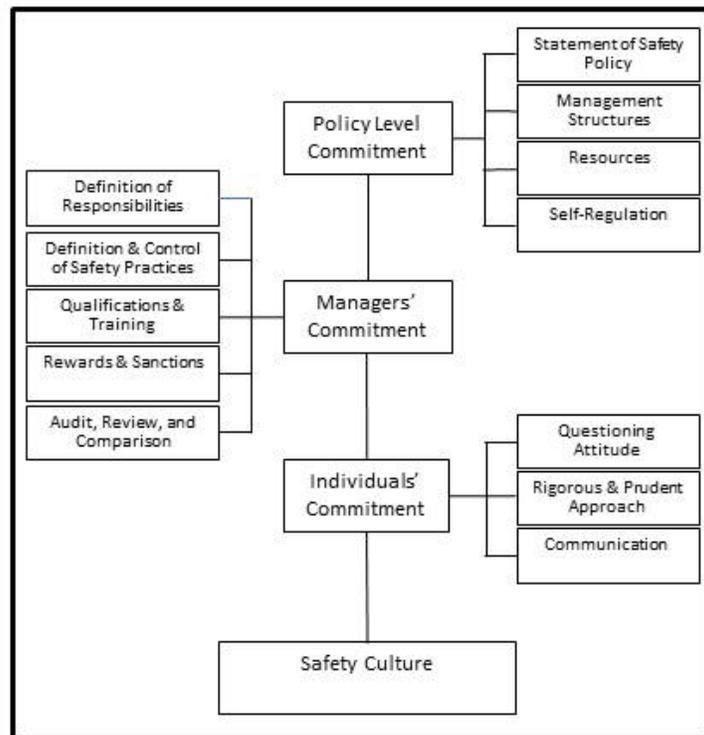
<sup>13</sup> Social structure is typically characterized as either nodes in a network (revealing varying properties such as density, centrality, and power), or a set of status positions and roles that carry various levels of prestige and other resources.

<sup>14</sup> Tsoukas (2000) uses managerial powers of control and cooperation as an example. These powers cannot be explained by reducing them to the powers of specified individuals. Instead, managers must be conceptualized as individuals who are connected to and representing the wider structure of the organization. The powers that accrue to managers are an example of the stratification process discussed in the previous paragraph.

normal operations conflicts with the need for flexibility and discretion during crisis conditions, and poses a dilemma for organizational design (Hofmann et al. 1995).

As Hopkins (2002) and Reason (1997) point out, the establishment of a formal organization creates roles, responsibilities, and systems that function at multiple levels, with a corresponding distribution of power and responsibility. The embedded, multi-level nature of formal organizations poses challenges for those attempting to conceptualize and develop effective assessment and intervention methods for them (Dov 2008; Zohar and Luria 2005). Because of the emergent powers and characteristics of social structures, simply adding up, averaging, or describing the characteristics of the constituent parts (for example, the individuals who make up an organizational unit) is not sufficient to describe these additional dimensions. Among the criticisms of organizational studies, including those focused on safety culture, are that inadequate attention is given to the issue of level of analysis and that the multilevel characteristics of and interactions within organizations are not addressed effectively (Glisson and James 2002; Mylett 2010; Walker 2010).

Figure 3.1 illustrates an attempt by IAEA to address the multi-level reality of organizational life by assigning the responsibilities and traits associated with safety culture to one of three system levels: policy, managerial, and individual (IAEA 1991).



Source: IAEA 1991 INSAG-4 1991

**Figure 3.1.** Illustration of the Multi-Level Aspect of Safety Culture

Although this graphic succeeds in calling attention to the multi-level nature of organizations and pointing out that organizational levels have implications for organizational culture, it fails to convey the complex and dynamic relationships that exist across levels and among the specified elements. For example, although individual commitment to communication is clearly important for effective communication to occur, this commitment is not likely to occur or persist absent managerial commitment to the establishment and maintenance of structures and processes that enable and support it. Unfortunately, with few exceptions, these complex dynamics and the mechanisms that drive them have not received focused attention in the safety culture literature. Nevertheless, prompted by Figure 3.1, it may be instructive to consider how each of the key safety culture traits would be described and measured—and changed—at each organizational level (individual, work group, management, organization).

### **3.1.2 Organizational Structures and Processes that Correspond to NRC Safety Culture Traits**

Culture, structure, and process are intertwined in organizations. Attempts to change the way people think, feel, and behave concerning safety, for example, must take into account the social structures and processes within the organization that shape and guide people's thoughts, emotions, and actions. Consequently, changing organizational structures or processes may sometimes be the most effective way to create a change in behavior and a necessary component of an intervention to change the culture. Some of the traits identified as key to an organization's safety culture correspond to organizational structures and processes that are central to the functioning of an organization. These include leadership, communication, work processes, and problem identification and resolution.

#### **Leadership**

Leaders perform essential functions in organizations and the quality and actions of leadership have widespread consequences for organizational culture and performance. Leaders have disproportionate power to affect an organization's culture through the priorities they establish, the behaviors and values they model, the rewards and penalties they administer, trust and distrust they engender, and the context and expectations they establish for interpersonal relationships, communication, accountability, and mindfulness. Leaders also exert disproportionate influence on the trajectory of organizational change initiatives. Review of the very extensive literature on leaders and leadership in organizations is well beyond the scope of this report. However, it is worth noting that effective and committed leadership is uniformly identified as crucial to the success of organizational development, cultural change, and organizational change initiatives (Burke et al. 2007). Consequently, information about the past performance of the organization's leaders can inform the evaluation of proposed interventions, which should include an assessment of leaders' willingness and ability to change, if necessary, and to provide the leadership needed for a successful intervention. Schein (2010) and Kouzes and Posner (2007) outline the leadership requirements of organizational change.

“Credibility is the foundation of leadership.” (Kouzes and Posner 2007:27).

## Communication

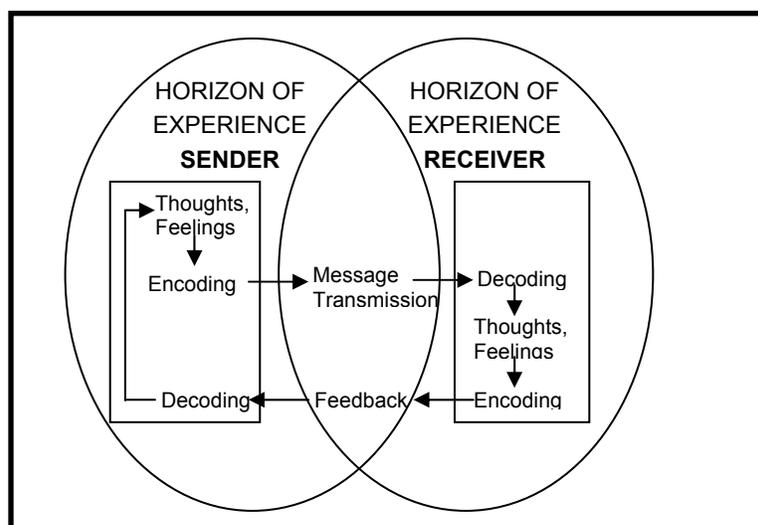
Barnard (1938), Garnett (2004), and Lorch (1978) identify communication as the management function most crucial to administrative success in organizations. The primary functions of organizational communication include (Neher 1997):

- gaining compliance (through informing, directing, regulating, socializing, and persuading);
- leading, motivating, and influencing;
- sense making;
- problem solving and decision making; and
- conflict management, negotiating, and bargaining.

Organizational members shape, define, and mark the boundaries of the organization through discourse about themselves, their work, and the organization. Through this process, they also establish the technical standards of the organization and develop a rich complex of formal and informal communication systems and patterns.

Garnett et al. (2008) argue that communication affects organizational performance through its effects on organizational culture. Myers and Myers (1982:xv) define organizational communication as “the central binding force that permits coordination among people and thus allows for organized behavior.” The *contextual* approach to communication focuses on both the content (e.g., the accurate exchange of information or adequacy of conveying the intended meaning) and the larger context of communication. It focuses on nonverbal cues as well as verbal content. It also looks at the relational context between the sender and receiver within the larger social/organizational/cultural context.

As shown in Figure 3.2, communication involves both sending (encoding and transmitting) and receiving (decoding and interpreting) messages. Consequently, effective communication requires individuals to have skills in both speaking and writing and in listening. Effective communication also requires a willingness to take the initiative to communicate.



Source: Adapted from White and Chapman (1996:11)

**Figure 3.2.** Sender-Receiver Model of Communication

Qing (2007) emphasizes that culture, power, and technology influence communication while also acknowledging that culture is learned through communication. People who share a culture, typically also share a communication “stand point” or frame of reference that is reflected in language structures (cultural orientation-forms), conversational rules that reflect organizational and group norms, and the distinction between individuals considered part of the “in-group” versus those who are part of the “out-group.”<sup>15</sup> Mindfulness, which is awareness of one’s own behavior and that of others, is an important element of communication by enabling the communicator to acquire the culture-specific information that leads to communication competence and reduces the incidence of miscommunication.

Although formal, top-down communication is important in organizations, upward communication from workers and information exchange among workers is essential for organizational learning and safe operations (Blegen et al. 2010; Center for Chemical Process Safety 2004; Tucker et al. 2008). Tucker et al. (2008) emphasize that perceptions about both organizational and co-worker support for safety affect workers’ safety communications in part by affecting their willingness to take the initiative to communicate. Common barriers to effective upward communication include reluctance to communicate upward for fear of reprisal; filtering and modification of ideas and concerns as they are transmitted upward; lack of attention and resistance to hearing and accepting critical feedback by managers; and poor listening and communication skills (Downs and Adrian 2004; McClelland 1988). Common barriers to effective communication exchange among workers are perceived group norms against such communication and fear of creating personal or intergroup conflict or tension (Tucker et al. 2008). Absent mechanisms to counteract them, biases toward the communication of and response to positive information can distort information exchange and the development of shared understanding in organizations (Beer and Eisenstat 2000; Sackmann and Phillips 2004; Tourish 2005; Tourish and Robson 2006, 2004).

Clark and Brennan (1991) emphasize the central role that grounding plays in communication. Without proper grounding, or establishing the context and purpose of the message, efficient communication cannot occur. Effective grounding depends upon an understanding of culture. Awareness of and attention to one’s own and the target audiences’ mindsets, assumptions, and mental models is a prerequisite for effective grounding. Failures in grounding can lead to socially constructed misunderstandings between people in different occupational groups, which can create communication gaps that can affect safety in high-risk work places (Rasmussen and Lundell (2012)).<sup>16</sup>

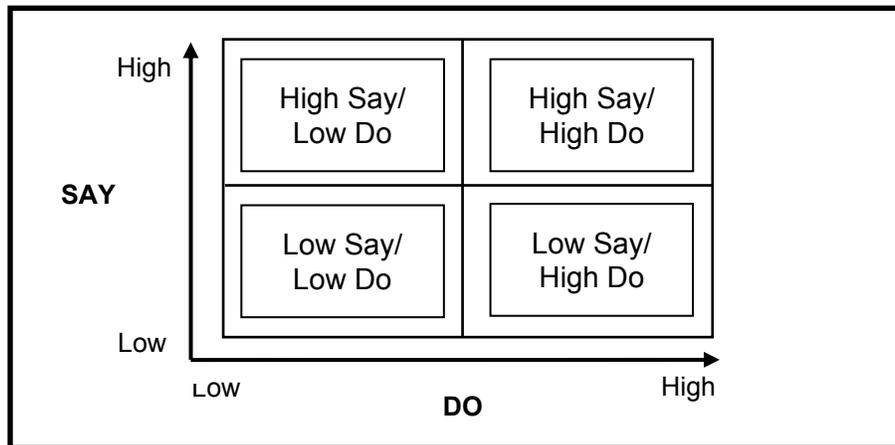
Lack of management commitment or clarity of purpose can result in situations in which managers say one thing but do another, as shown in Figure 3.3 (D’Aprix 1996). This conflict between formal and informal communications reduces the clarity of the communication and requires workers to expend time and energy monitoring and evaluating the appropriate interpretation of the competing messages. In such situations, managerial behavior is generally interpreted as the more valid indicator of management values and priorities. Persistent mismatch between say and do can lead workers to discount formal communications and develop a skeptical or cynical view of managers and formal communications.

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<sup>15</sup> They found that the cultural dimensions that had the greatest influence on communication standpoint were: a) achievement—nurturing; b) tolerance for ambiguity/uncertainty c) power distance; and d) individualist—collectivist.

<sup>16</sup> Linell’s (1998) dialogue theory is used to explain and examine these types of gaps.

Garnett et al. (2008) examined the contribution of communication to organizational performance. They found that in mission-oriented organizations, communication had a significant indirect effect on organizational performance. They examined three types of communication—task-oriented, feedback, and upward—and found each had a significant



Source: Adapted from D'Aprix (1996:39-40)

**Figure 3.3.** Sources of Conflict between Formal and Informal Communications

mediating effect on performance. Downs et al.'s (1984; 1988) review of research on this topic found a positive relationship between feedback and task performance for both individuals and groups, although the timing, content, and manner of delivery of the feedback influenced this effect.

Organizational communication is often characterized as vertical, lateral, or diagonal. Vertical communication refers to communication between individuals located at different levels in the organizational hierarchy. Vertical communication can be upward or downward. Lateral communication is communication between individuals within a hierarchical level of an organization and diagonal communication is communication between managers and workers located in different functional divisions of an organization (Wilson 1992). Downward communication, i.e., from an individual higher in the organization to an individual lower in the organization, typically dominates in formal organizations. Larkin and Larkin (1994) found that downward communication is most effective when top managers communicate directly with immediate supervisors and immediate supervisors communicate with their staff. A wealth of evidence shows that increasing the power of immediate supervisors increases both satisfaction and performance among employees.<sup>17</sup> Organizations can empower supervisors by patterning communications so that supervisors are the direct recipients of organizational communications and have an opportunity to provide input to decisions. Ensuring that supervisors are informed about organizational issues/changes before staff in general, and then allowing them to communicate these issues/changes to their staff, helps create and reinforce their power.

<sup>17</sup> This was first discovered by Donald Pelz (1952) and is commonly referred to as the *Pelz effect*. Pelz was attempting to find out what types of leadership styles led to employee satisfaction (informal/formal, autocratic/participative, management-oriented/frontline-oriented). He found that what mattered most was not the supervisor's leadership style but whether the supervisor had power. Jablin (1980), after reviewing almost 30 years of research, pronounced the Pelz effect to be "one of the most widely accepted propositions about organizational communication."

Research has shown that when the supervisor is perceived to have power, employees have greater trust in the supervisor, greater desire to communicate with the supervisor, and are more likely to believe that the information coming from the supervisor is accurate (Roberts and O'Reilly 1974). Lower trust in supervisors can negate the positive effect of feedback on worker motivation and performance.

### **Work Processes**

The NRC has identified work processes as an important element of safety culture. More specifically, the NRC's concern is with the process of designing and controlling work so that safety is assured. Aside from some discussion in the quality management literature, the literature reviewed for this report offered little insight into the relationship between work processes and organizational culture or the organizational and cultural consequences of work process design. However, it is useful to consider several aspects of work processes where organizational cultures can vary significantly:

- overall design of workflow including assignment of responsibilities to work groups and individuals;
- beliefs and practices concerning the extent to which work activities should be specified and monitored;
- norms of compliance with policies and procedures; and
- beliefs and practices concerning how policies and processes are redesigned and how the change process is managed.

As has been discussed extensively in the organizational literature (Burns and Stalker 1961), organizations tend to choose between two cultural models: a model that emphasizes vertical control, intense supervision, and a high degree of specification of work activities versus a model that emphasizes greater self-control and individual autonomy grounded in expertise, collaborative decision making, and teamwork. The HRO approach reviewed earlier tends toward the second model – basing its high reliability around professionalism, self control, and rapid team-based response to off-normal situations. However, many organizations operating high-risk technologies favor the first model employing detailed procedures and intensive supervision with top-down decision making. The nuclear power industry has come to recognize value in both models and the two types of work process control they reflect.

Hofmann et al. (1995) provide an informative discussion of the dilemma posed by the preference or need for vertical control and work specification during normal operations and the preference or need for flexibility and individual autonomy during periods of emergency. They note that one of the biggest management challenges facing the nuclear industry is how to realize the benefits of both approaches given that at the cultural level, mixed models create internal inconsistencies.

### **Problem Identification and Resolution**

The NRC has also identified problem identification and resolution as an important element of safety culture, particularly the prompt identification, full evaluation, and prompt resolution of safety-relevant issues. According to the functional approach to leadership, organizational and team leaders have responsibility for diagnosing group and organizational deficiencies, taking remedial action, forecasting impending changes, and preventing harmful environmental changes or their effects (Burke et al. 2007; McGrath 1962). Consequently, in addition to their direct effect on safe operations, the extent and manner with which these leadership

responsibilities are fulfilled serve as a visible, behavioral demonstration to workers of the priority given to safety in the organization.

The ability and willingness of workers and managers to identify and address problems is the basis for organizational learning and improvement (Garvin 1993). Ability and willingness are affected by many of the individual and organizational characteristics important to organizational safety and safety culture (Keil and Park 2010). The manner in which problems are addressed reveals much about an organization's culture. Senge (1990a) notes that problem identification and problem solving can be approached with different mindsets, one that does not challenge the mindset that created the problem in the first place (adaptive learning) and one that does (generative learning). Argyris (2010) and Argyris and Schein (1996) emphasize the importance of learning through the identification, evaluation, and resolution of problems for organizational change and development. However, Barrett (1995), an advocate of appreciative inquiry, warns that a mindset focused on problem solving can have the detrimental consequence of furthering a deficiency orientation, a fragmented view of the world, and a separation between stakeholders if it does not also focus on how to capitalize on the assets and strengths of the organization. This concern is consistent with Schein's (2010) point that change is accomplished more successfully by leveraging an organization's strengths than by trying to overcome or correct its weaknesses.

## **3.2 Individual Perceptions, Responses, and Behaviors**

### **3.2.1 Perceptions, Cognitions, and Emotions**

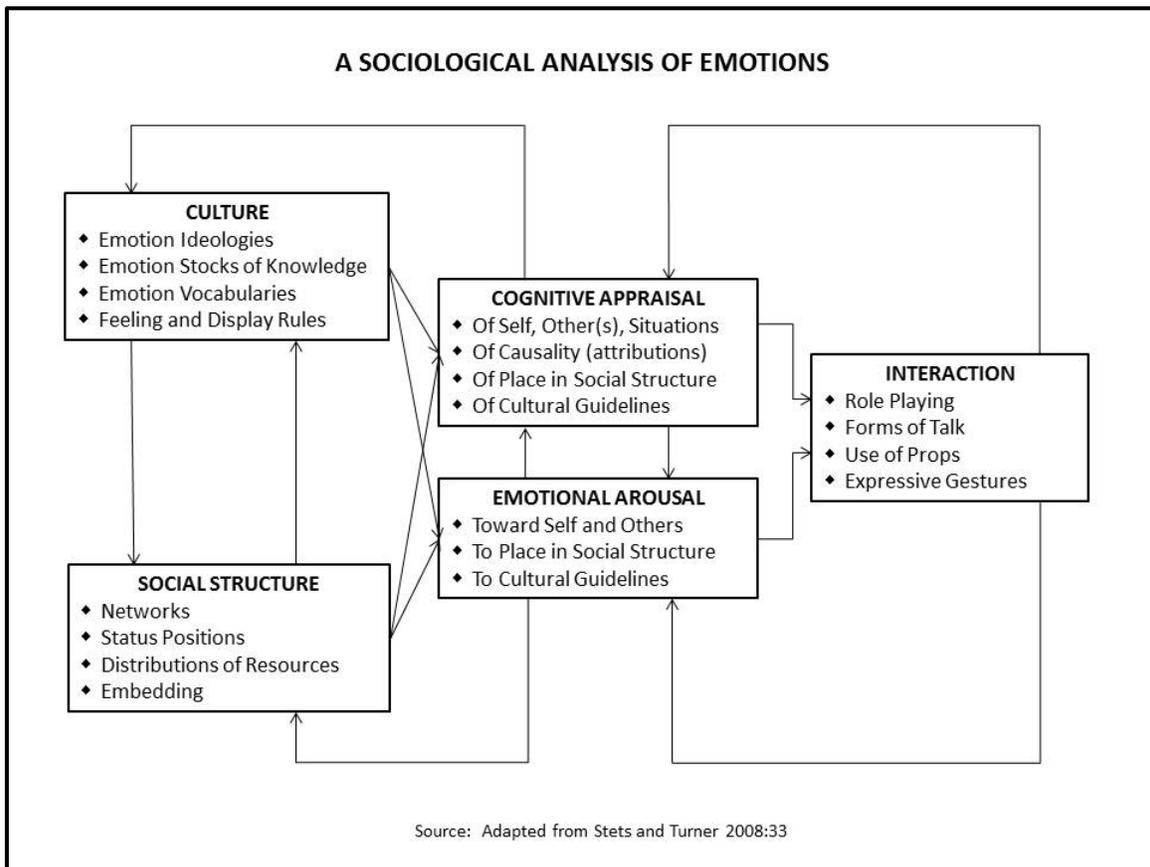
Perceptions, cognitions, and emotions are guided by culture and constrained by one's location in social structures (Fogel et al. 1992). Perceptions are shaped by learning, memory, and expectations. Emotions serve as frames, influencing how incoming information is perceived and interpreted (Nabi 2009). Reflecting the power of social norms, thoughts, feelings, and behavior are shaped to varying degrees not only by individual attributes but also by the actual, imagined, or implied presence of others (Jones 1998:8).

“Human beings are emotional, rational, and instrumentally orientated agents who seek to ensure that their social relations and arrangements meet their emotional, cognitive, and instrumental needs and conform to their sense of what is appropriate in each concept” (Misztal 1996:22).

For these reasons, individuals may perceive, frame, and interpret the same information or event differently, sometimes quite differently. The field of social psychology developed in response to the recognition of the “human diversity within cultural uniformity” (Jones 1998: 8). This diversity can lead to miscommunication and misunderstandings and is an important reason that safety culture assessments require careful and in-depth inquiry and change initiatives require careful monitoring for divergent interpretations of intent or direction.

Culture shapes the way that people frame and interpret the information they receive. It provides cognitive guidelines to individuals about what thoughts and emotions should be experienced and expressed in different situations and what vocabularies to use in describing their thoughts and emotions (Hofstede 1991; Stets and Turner 2008:32-34). Consequently, culture influences what people pay attention to and how they interpret and communicate about what they see, hear, think, and feel (Berger and Luckman 1966; Hallahan 1999; Nisbett et al. 2001).

Figure 3.4 illustrates the complex processes that are involved in the evocation, appraisal, and expression of emotion.



**Figure 3.4.** Emotions in Social Interaction

Individuals are often not consciously aware of the cognitive structures, expectations, and framings that are influencing their perceptions, cognitions, emotions, and behaviors (Kahneman 2011). From a safety culture perspective, this becomes important when individuals, groups, or entire organizations exhibit cognitive structures, expectations, or framings that lead to perceptions, cognitions, emotions, and behaviors that are contrary to safe operations or to resistance against interventions designed to strengthen the organization’s safety culture and safety performance (Lamm and Gordon 2010; Weick 1969).

Weick (1995) and Weick et al. (2005:410) define sense making as “the ongoing retrospective development of plausible images that rationalize what people are doing.” They discuss the important role a particular type of sense making plays in enabling HROs to continually organize with a focus on

the experience of being thrown into an ongoing unknowable, unpredictable streaming of experience in search of answers to the question, ‘what’s the story?’....The operative image of organization is one in which organization emerges through sense making, not one in which organization precedes sense making or one in which sense making is produced by the organization.

This highlights a way that “double loop learning,”<sup>18</sup> identified by Argyris and Schein (1996, 1978) as essential for continuous learning, can become embedded in the culture of the organization. Consequently, it may be necessary for the safety culture assessment or intervention planning team to gain an understanding of the perceptions, cognitions, and emotions that are the basis for the problematic status of a particular cultural attribute, are a barrier to change, or that provide a particular strength that can be leveraged to help emergence of the desired culture. Luria and Rafaeli (2008) suggest a method for gaining an understanding of workers’ perceptions, cognitions, and emotions about an organization’s existing safety promotion efforts by examining their interpretations of organizational safety artifacts, such as safety signs. This approach, a form of projective testing, can supplement the kind of information gained from in-depth interviews to inform the design of safety culture interventions.

The role of emotions in organizational and cultural assessments is often ignored. However, because emotions affect perceptions and motivation, and therefore behavior and judgment, they play a critical role in organizational life and performance.<sup>19</sup> Skills in perceiving emotions, reasoning with emotions, understanding one’s own and others’ emotions, and managing emotions<sup>20</sup> affect an individual’s ability to operate effectively within organizational systems. Confidence in those skills increases willingness and ability to raise questions, challenge assumptions, and call attention to safety issues. If workers and leaders do not have these skills and this confidence, many of the traits identified as key to safety culture cannot be realized (Salovey and Mayer 1990; Mayer et al. 2008, 2004; Quinn 1996).

Each of these elements should be considered in the design of proposed interventions and the evaluation of their likely effectiveness.

### **3.2.2 Values, Attitudes, and Social Norms**

Three terms included in nearly every discussion of culture are values, attitudes, and social norms. It is useful to clarify the meanings of these terms and the role each plays within a culture. All three play evaluative roles. Values have a central role in virtually all definitions of culture. Values are global and abstract. They reflect broad tendencies to prefer “certain states of affairs over others” (Hofstede 1998:478). Values identify what should be judged as good, bad, or evil.<sup>21</sup> Values—like culture—are relatively stable, although they are subject to change over time as a consequence of experience, ongoing interaction with others, and changing context. Like culture, values rely on the meanings elicited through processes of social interaction and social ordering (Evans 2007:10-11). Consequently, values become shared, or cultural, phenomena.

Values are predictors of social attitudes and behaviors (Rokeach and Ball-Rokeach 1989). Because values deal with preferences, the relative rank of a value in the hierarchy of values, in terms of salience and importance, affects its influence on attitudes and behaviors. A number of the traits considered necessary for a positive organizational culture correspond to values and

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<sup>18</sup> Double loop learning is the mechanism by which members of an organization are prompted by new information to modify their mental models and framing,

<sup>19</sup> Emotions entail: 1) cognitive appraisal or evaluation, 2) physiological arousal, 3) subjective feelings, 4) motivation, including behavior intentions or readiness, and 5) motor expression (Nabi 2009).

<sup>20</sup> Sometimes referred to as emotional intelligence.

<sup>21</sup> “A Value is a conception, distinctive of an individual or characteristic of a group, which influences the selection from available modes, means, and ends of action” (Kluckhohn 1951:395 cited in Evans 2007:7).

norms that are among the most fundamental and important in American social life. These include trustworthiness, responsibility, and fairness. Given this congruence, it is not surprising that these traits are often included among those considered necessary for any high performing organization (Reason 1998; Sutcliffe 2011).

The literature makes an important distinction between “espoused values” and “enacted values or ‘values-in-action’” (Argyris and Schein 1996, 1978; Schein 2010). Espoused values are the values individuals, groups, and organizations say they have and use and often believe they have and use. Espoused values can be instructive by revealing aspects of the cultural “ideal.” Consequently, it would be cause for concern to find that an organization’s espoused values did not prominently include those consistent with a positive safety culture, or worse, included values that were in conflict or at odds with a positive safety culture. In addition, because an organization’s enacted values may not match its espoused values, a cultural assessment should investigate enacted values and their relative importance as well. Mismatches between espoused and enacted values are often not recognized by the organization’s members, but can adversely affect organizational behavior and commitment. Consequently, identification and description of the mismatches and organization members’ views about them are not only important to the assessment of an organization’s culture, but also to the design and implementation of interventions as well.

Social norms are closely related to values, but are more specific. Social norms are values, attitudes, and behaviors that are expected, accepted, and approved—considered normative—within a social group. Social norms can extend to mindsets and ways of thinking. Evans (2007:6) observes that norms are “the attitudes we think everybody else has.”

All social groups develop norms. Individuals are influenced by their perceptions of and beliefs about the norms of the individuals and social groups that are meaningful to them. Three aspects of this influence are important to the state of an organization’s safety culture and for interventions designed to change it. One is the individual’s perceptions of and beliefs about what the norms are (i.e., what the actual patterns of behavior, attitudes, values are; what other people in the social group are doing).<sup>22</sup> A second is the individual’s perceptions of and beliefs about what others’ reactions will be if they do or do not conform to a particular norm. The third is how motivated the individual is to comply with the norm. Much research has been conducted to gain a better understanding of social norms and their influence on behavior and the success of interventions (Fishbein and Ajzen 1975; Glanz et al. 2008).

The NRC safety culture traits could also be characterized as social norms. That is, an organization with a positive safety culture will exhibit strong social norms concerning personal accountability, continuous learning, raising concerns, a respectful work environment, and a questioning attitude. Determining the best strategy for dealing with norms that are inconsistent with a positive safety culture is likely to be one of the major challenges facing safety culture interventions. Consequently, the literature on the establishment and modification of social norms is pertinent to the assessment of safety culture and the design of interventions. For example, studies of a number of interventions that focused on changing behavioral norms found that the natural inclination to emphasize the prevalence of the problem behavior and its adverse consequences in an effort to raise awareness, create urgency, and persuade people not to engage in that behavior, often has the opposite effect. Instead of persuading people to avoid

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<sup>22</sup> This is sometimes referred to as “descriptive norms.”

that behavior, these messages reinforce perceptions that the undesirable behavior is the norm and inadvertently increase perceptions that it is normatively acceptable to engage in the targeted behavior (Cialdini et al. 2006). The literature on changing norms in the environmental and public health domains is extensive and pertinent to the design and evaluation of intervention strategies (Cialdini et al. 2004; Glanz et al. 2008).

Like values and norms, attitudes have both affective (emotional) and cognitive (belief) dimensions. Zimbardo, and Leippe (1991:12) define attitudes as “an evaluative disposition toward some object based upon cognitions, affective reactions, behavioral intentions, and past behaviors ... that can influence cognitions, affective responses, and future intentions and behaviors.” Attitudes are “summary evaluations of objects (e.g., oneself, other people, issues) along a dimension ranging from positive to negative” (Petty et al. 1997:611).

Like values and norms, attitudes are not directly observable in themselves. However, they act to organize and provide direction to actions and behaviors that are observable. Many refer to attitudes as “predispositions to respond” (Zimbardo and Leippe 1991). Attitudes are related to how people perceive and judge the situations in which they find themselves. Attitudes vary in direction (either positive or negative), in degree (the amount of positiveness or negativeness), and in intensity (the amount of commitment with which a position is held) (Petty et al. 1997).

Attitudes influence behavior in complex ways (Ajzen and Fishbein 2005). Attitudes an individual holds with confidence, recalls with ease, and which are decisive (as opposed to ambivalent, inconsistent, or conflicting) are better predictors of behavior than attitudes without these characteristics (Cavazza and Serpe 2009; Glasman and Albarracín 2006; Petty et al. 1997). Attitudes change as individuals consider new evaluative information, although research has shown that individuals tend to avoid receiving and considering information that contradicts or challenges an existing attitude (Bohner and Dickel 2011; Eagly and Chaiken 1993; O’Keefe 2003, 2009). There is an extensive literature on strategies for changing attitudes (Bohner and Dickel 2011; Glasman and Albarracín 2006; Wood 2000). The design and evaluation of interventions whose success depends upon attitude change should reflect the findings and lessons learned from this body of research.

Many of the approaches to assessing safety culture focus at least in part on assessing attitudes.<sup>23</sup> How people evaluate what they observe related to safety forms the basis for much of how safety culture is characterized in the assessment process. However, this evaluation process is subject to the factors that establish an individual’s “predisposition to respond.” These factors include the more basic values that dominate in an organizational culture or subculture, the mental models and frames of reference that shape what people perceive, implications for impacts (positive or negative) on the individual or group, and the memory that each individual has of organizational history. These issues suggest that both the assessment process and the design of interventions must go beyond the surface characterization of attitudes to illuminate the factors that shape attitudes and influence the confidence with which they are held, the ease with which they are recalled, and their decisiveness.

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<sup>23</sup> Questionnaire surveys are often used to measure attitudes about an organization’s safety culture. Care is required in developing questions about attitudes. Safety culture questionnaires often combine attitude measures with measures that assume that the respondent is an informed and accurate reporter of facts. For example, the question “Is safety emphasized sufficiently by upper management?” contains both an attitude component and a factual observation component that may also be subject to error based on the respondent’s knowledge. In practice, it is very difficult to separate these two components.

### 3.2.3 Beliefs

A belief is a proposition held to be true. Beliefs reflect an individual's perception of a relationship between two objects and a characteristic of it, for example, "children are people," or "people are fundamentally good."<sup>24</sup> Beliefs are considered by many to be the best indicators of the decisions individuals will make (Bandura 1986; Rokeach 1968). Lester (2000:1) argues that because beliefs are biologically designed to augment and enhance the functions of the senses they are also designed to be strongly resistant to change.

Functionally, our brains treat beliefs as internal "maps" of those parts of the world with which we do not have immediate sensory contact. As I sit in my living room I cannot see my car. Although I parked it in my driveway some time ago, using only immediate sensory data I do not know if it is still there. As a result, at this moment sensory data is of very little use to me regarding my car. In order to find my car with any degree of efficiency my brain must ignore the current sensory data (which, if relied on in a strictly literal sense, not only fails to help me in locating my car but actually indicates that it no longer exists) and turn instead to its internal map of the location of my car. This is my belief that my car is still in my driveway where I left it. By referring to my belief rather than to sensory data, my brain can "know" something about the world with which I have no immediate sensory contact. This "extends" my brain's knowledge of and contact with the world.

### 3.2.4 Motivations and Behaviors

The goal of maintaining a positive safety culture implies that individuals throughout the organization are motivated to behave in a manner consistent with safety. A common definition of behavior is "action taken by an individual that changes the individual's relationship to his or her environment." Katz and Kahn (1978) identified three types of forces that serve to reduce the variability of human behavior in organizations: environmental pressures from the direct, observable requirements of a given situation; shared values and expectations; and rule enforcement. McClelland (1988:4) identified motivations, cognitions or schemas, and skills or adaptive traits as the three major determinants of behavior. The behavior of individuals in small groups and organizations and the factors that affect behavior (organizational behavior) is a significant field of study.

A primary focus in organizational behavior studies has been to identify principles of behavior in order to identify how to elicit desirable behaviors and prevent undesirable behaviors. Major areas of study include leadership and motivation (how to elicit desired behaviors).<sup>25</sup> Motivation is defined as energizing forces that shape perceptions and stimulate arousal, direction, and persistence of behavior (Iguisi 2009; Stevens and Fiske 1995). Within organizations, the process of motivating appropriate behavior is simple on the surface but complex in practice. Research on motivation has focused on identifying and characterizing what motivates people, (i.e., the needs and goals that energize behaviors and the relationship of beliefs, values, and goals with behaviors) and on the mechanisms that underlie the motivation process, for example how expectations affect motivation and behavior.

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<sup>24</sup> Pajaras (1992) points out that the distinction between beliefs and knowledge is often not clearly articulated or understood.

<sup>25</sup> Motivation is defined by Vroom (1964) as a "process governing choices among alternative forms of voluntary activities."

Motivations are typically characterized as subjectively experienced desires or wishes that result in a sense of satisfaction if they are fulfilled and a sense of frustration if they are not (D'Andrade 1993:23). Motivation is seen as the basis of individual action. Motivations are often conceptualized as either drives (internal stimuli such as hunger or sex), needs, or goals and incentives (D'Andrade 1993:24). Incentives are designed to create goals toward which individuals are motivated to strive. Intrinsic motivations are those which arise internal to the individual (for example, need for affiliation, need for achievement, self-efficacy); extrinsic motivations are those applied from external sources (for example, prizes, praise, monetary rewards). Katz and Kahn (1978) argue that legal compliance, external rewards, and internalized motivation form the bases of motivations pertinent to formal organizations. Herzberg (1968) contends that interesting work, challenge, and increasing responsibility are among the most powerful motivators for individuals in organizations. Ensuring that a proposed change initiative motivates the desired behaviors and eliminates or counteracts motivation for undesirable behaviors is an important aspect of the change design and implementation processes (Hale et al. 2010a; Hedlund et al. 2010).

Among the most familiar theories about what motivates people are Maslow's (1962) hierarchy of needs and McClelland's (1961, 1988) three-factor theory of powerful motivators (need for achievement, need for affiliation, and need for power) (Miner 2003; 2005).<sup>26</sup> A wide variety of theories have been developed to help organizations understand the organizational attributes that affect worker motivation and behavior.<sup>27</sup> These attributes include, among others, the design of the job,<sup>28</sup> the nature of the goals,<sup>29</sup> the perceived equity of the employer-employee exchange,<sup>30</sup> worker expectations about the consequences of particular behaviors or decisions,<sup>31</sup> and the nature of the relationship between the manager/supervisor and the employee.<sup>32</sup> Each of these factors (and more) can influence the efficacy of an effort to motivate safety-related behavior. Thus, the design of interventions to enhance worker motivation relative

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<sup>26</sup> McClelland (1988) later added "avoidance" motives to his list of motivation systems. Avoidance motives include avoidance due to fear of failure, fear of affiliation, etc.

<sup>27</sup> See Miner (2003) for a review of 73 organizational behavior theories in terms of their importance, demonstrated validity, and usefulness as rated by a panel of experts.

<sup>28</sup> For example Hackman and Oldham's (1976) Job Characteristics Theory, which postulates that skill variety, task identity, task significant, degree of autonomy, and feedback were job characteristics that would create high intrinsic motivation, high job performance, high job satisfaction, low absenteeism, and low turnover by increasing the meaningfulness of the work, worker's responsibility for outcomes, and worker's knowledge of results.)

<sup>29</sup> For example, Locke and Latham's (1990, 2006) Goal-Setting Theory, which postulates that high goals lead to greater effort and/or persistence than moderately difficult, easy, or vague goals do. Goal effects depend upon the worker having the requisite task knowledge and skills and combine with self-efficacy to mediate other potentially motivating variables such as personality traits, feedback, participation in decision making, job autonomy, and monetary incentives. The key moderators of goal setting are feedback, commitment to the goal and viewing the goal as important, task complexity, and situational constraints. Goals affect performance only when overload is low (Locke and Latham 2006:265).

<sup>30</sup> For example, J.S. Adams' (1963) Equity Theory, which postulates that workers seek to maintain equity between the inputs they provide to the employer and the outcomes they receive from the employer and that workers value fair treatment and when receiving fair treatment are motivated to maintain it with their coworkers and the organizations.

<sup>31</sup> For example, Vroom's (1964) Expectancy Theory, which postulates that behavioral choices are influenced by motivational forces. Motivational force is defined as the product of three factors: 1) expectancy, the belief that a certain effort will lead to the intended performance; 2) instrumentality, the probability that this performance will achieve a certain result/reward; and 3) valence, the desirability of the result/reward to the individual. Trust, control, and organizational policies affect the individual's estimates of instrumentality.

<sup>32</sup> For example, Graen and Scandura's (1987) Leader-Member Exchange Theory, which postulates that the quality of the relationship between a leader and a member of the organization influences worker motivation and performance. High quality relationships are characterized by trust, respect, openness, and autonomy.

to safety culture must take such factors into account and seek to use them effectively. Assessing how well this has been accomplished is an important part of an evaluation of proposed interventions.

### **3.3 Dimensions of Social Interactions**

A number of the traits the NRC and other organizations identify as essential elements of a positive safety culture are core dimensions of social interactions. These include trust, accountability, respect, and fairness/justness. Each of these dimensions represents an aspect of the relationships that individuals create as they interact with one another. Research shows that the status of these dimensions in organizations are correlated with one another—problems with one tend to be related to problems with all—and that they individually and collectively affect employee commitment, motivation, and behavior (Demir 2011). The assumptions, perceptions, expectations, and attitudes individuals have about these dimensions of the social interactions in an organization, management’s support and modeling of them, and subsequently, the norms established for them within the organization constitute important aspects of an organization’s culture and social environment in general and its safety culture in particular. The status of these dimensions affects what interventions are needed to achieve a positive safety culture and also how those interventions should be implemented. This section of the report provides a brief overview of how the social science literature defines and discusses these dimensions of social interaction and the factors that affect and emerge from them.

#### **3.3.1 Trust**

Trust and trustworthiness are among the most frequently discussed concepts in studies of organizational and safety culture (Burke et al. 2007). Some aspect of trust is at the core of every social interaction.<sup>33</sup> Trust is considered key to positive interpersonal relationships and a central component of effective working relationships (Ayree et al. 2002; Misztal 1996). The nature and level of trust between workers and their managers and supervisors affects all aspects of their relationship and influences their attitudes and behaviors (Caldwell and Hayes 2007; Conchie et al. 2006; Flin and Burns 2004; Kath et al. 2010a, b; Li et al. 2011; Scandura and Pellegrini 2008). Studies of organizations have found that trust in management is positively related to employee job performance, organizational citizenship behavior,<sup>34</sup> and engagement in safety

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<sup>33</sup> McKnight and Chervany’s (1996:26) extensive review of the literature identified six dimensions of trust:

- trusting intention—the extent to which one party is willing to depend on the other party in a given situation with a feeling of relative security, even though negative consequences are possible
- trusting behavior—the extent to which one person voluntarily depends on another person in a specific situation with a feeling of relative security, even though negative consequences are possible
- trusting beliefs—the extent to which one believes (and feels confident in believing) that the other person is trustworthy in the situation (i.e., that the other person is able and willing to act in the other person’s best interests because they are benevolent, honest, competent, have integrity, and are predictable)
- system trust—the extent to which one believes that proper impersonal structures are in place to enable one to anticipate a successful future endeavor (i.e., that there are structural assurances that provide safeguards, such as regulations, guarantees, contracts, etc.; and that the system is sufficiently stable)
- dispositional trust—the extent to which the individual has a consistent tendency to trust across a broad spectrum of situations and persons
- situational decision to trust—the extent to which one intends to depend on a non-specific other party in a given situation (without regard to the specific person involved).

<sup>34</sup> Organizational citizenship behavior is discretionary behavior that is beneficial to the organization but beyond the basic requirements of the job.

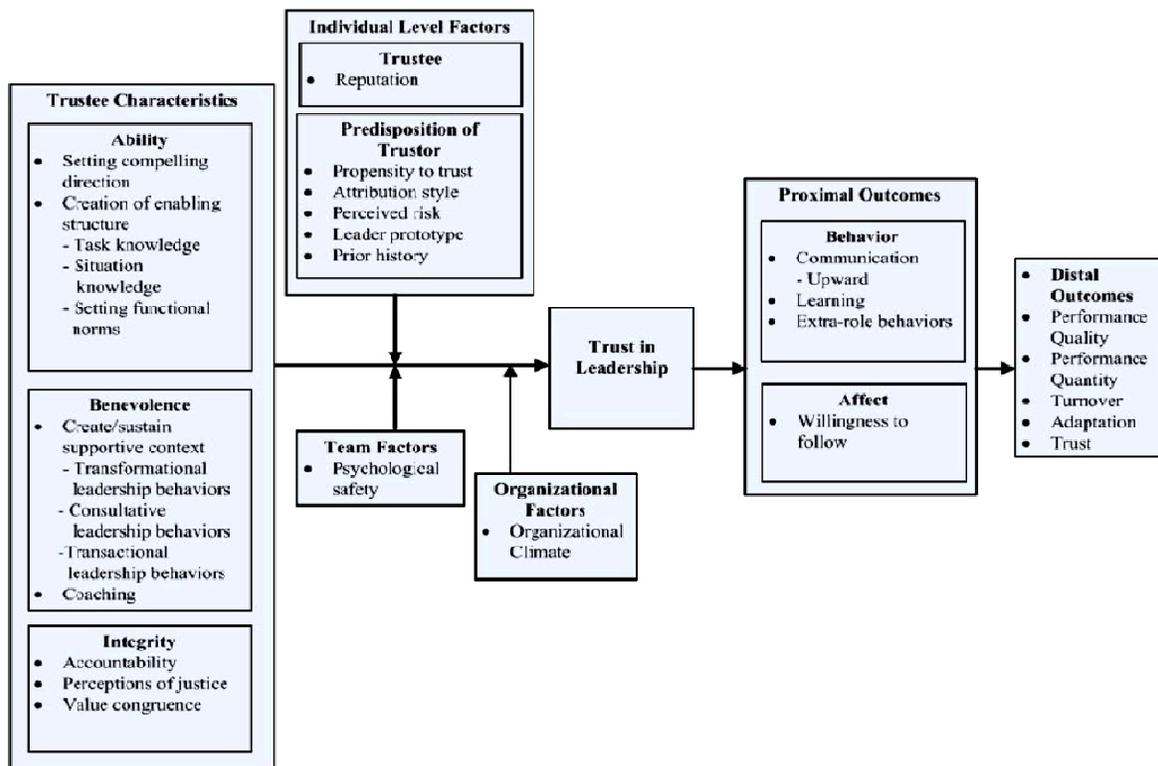
behaviors (Burns et al. 2006; Colquitt et al. 2007; Dirks and Ferrin 2002; Scandura and Pelligrini 2008; Scandura 1999). Distrust of management tends to reduce feelings of personal responsibility for safety (Jeffcott et al. 2006).

Reason (1998) argues that trust rests at the center of safety culture. At an individual level, trust involves the willingness of one person to depend on another person, with a relative sense of security, even though doing so could result in negative consequences. The decision to trust is a choice and involves a risk. Therefore, the perceptions of the person making this decision (the “trustor”) about the other person (the “trustee”) influence this decision. The perception that an individual is benevolent, competent, has integrity (honest and just), and is predictable increases the likelihood that he or she is seen as trustworthy (Conchie et al. 2006; Mayer et al. 1995; and McKnight and Chervany 1996).

Trust affects social interactions in multiple ways pertinent to safety. For example, Reason (1997), O’Leary and Chappell (1996), and (Watson et al 2005) argue that organizational trust instills confidence that the organization is just and fair, which promotes open communication and accurate reporting, which enhances organizational learning and promotes the development of shared perceptions and norms. In studies of safety culture, higher levels of trust are associated with positive safety attitudes (Donald and Young 1996), reduced risky behavior (Watson et al. 2005), and increased personal responsibility for safety (Hofmann and Stetzer 1998). Open communication, fairness, and management accountability, along with demonstrations of the attributes associated with trustworthiness, are the most frequently identified mechanisms that build trust in management (Conchie and Burns 2008). As shown in Figure 3.5, the model developed by Burk et al. (2007) reflects many of these relationships. Trustee and trustor characteristics, combined with team and organizational factors establish the level of trust in leadership. Trust in leadership affects behavior and affect, which in turn affect a variety of broader organizational outcomes.

Distrust or lack of trust also affects social interactions and behaviors. Given the element of personal risk associated with decisions to trust, trust decisions are accompanied by decisions about the degree of vigilance, monitoring, and regulation—or distrust—needed to address that risk. Lack of trust or high levels of distrust are associated with lower levels of engagement, a greater tendency for individuals to raise the priority they give to self-interests relative to group or organizational interests, and increased specification of accountability measures (Maynard and Bloor 2003). However, excessive trust can lead to inadequate checking and vigilance.

Consequently, Conchie and Donald (2008) and Conchie et al. (2011) point out that trust should be balanced with distrust in order to avoid behaviors that are dysfunctional for maintaining safety. As shown in Figure 3.6, they argue that the effects of trust and distrust are complex, and that both their functional (beneficial) and dysfunctional (adverse) effects on behavior should be taken into account when setting goals or assessing the appropriateness of the trust-distrust balance. This is similar to Langfred’s (2004) observation that high levels of trust among work team members can reduce their motivation and willingness to monitor one another.

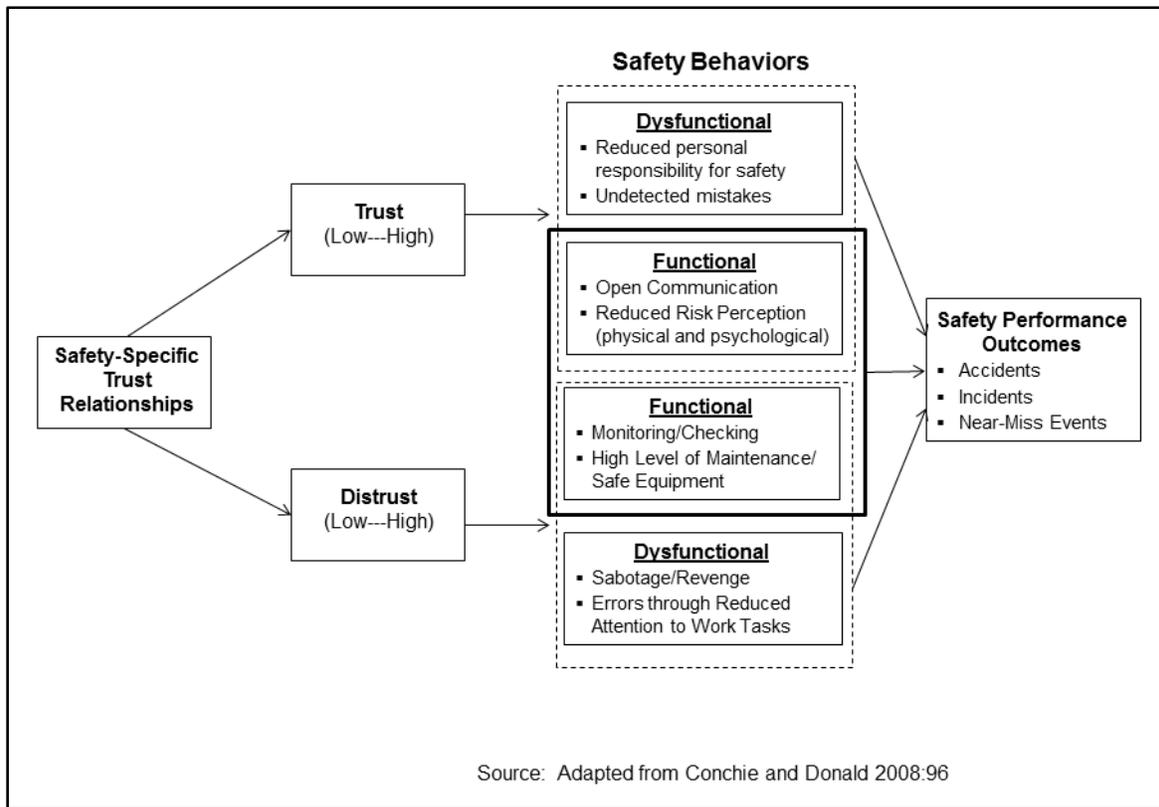


Source: Burke et al. 2007:613

**Figure 3.5.** The Influence of Trust on Behavior, Affect, and Performance in Organizations

Trust is also integral to the process of social influence. Trust affects the persuasive power of an individual or an intervention. Efforts to influence or persuade are more likely to succeed when those attempting to persuade or influence are trusted and the effort is perceived to be trustworthy (Abrams et al. 2003; Ajzen and Fishbein 2005; Glanz et al. 2008; O’Keefe 2009).

However, trust is fragile. It is difficult to build but easy to lose. A well-documented asymmetry exists in which negative indicators reduce trust more than positive indicators increase it. Consequently, trust plays an important role in the creation and maintenance of an organization’s culture and is an important consideration in the design of interventions and the selection of change agents and communicators (Cox et al. 2006). The evaluation of proposed interventions to strengthen an organization’s safety culture should therefore consider the current status of organizational trust and its implications for response to the proposed intervention by individuals at different locations in the organization as well as the likely impacts of the proposed intervention on organizational trust.



**Figure 3.6.** Trust and Distrust Effects on Safety Behaviors and Safety Performance Outcomes

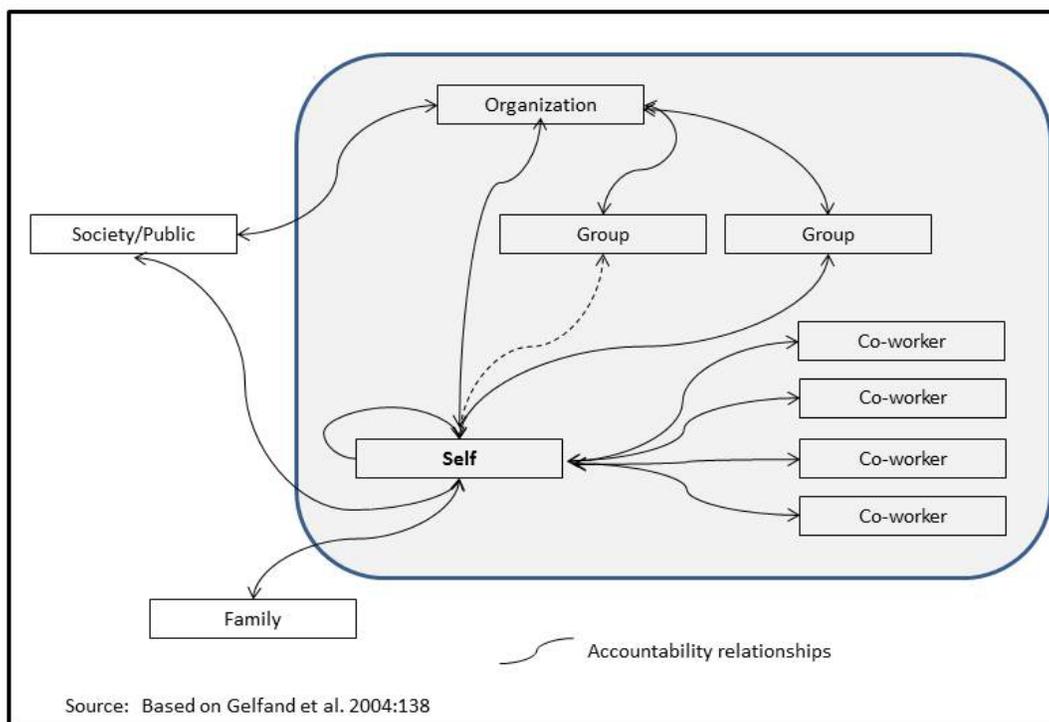
### 3.3.2 Accountability

Accountability is a core concept in ethics, governance, and management. Accountability serves as a fundamental mechanism for norm enforcement and is generally considered one of the prerequisites for the survival of a social system (Gelfand et al. 2004; Tetlock 1992). It provides an important mechanism through which common expectations and coordination can occur. Accountability entails evaluation of one's decisions or actions by others, the onus of justifying or defending those decisions/actions, and assignment of responsibility for the consequences that result from the decision/action (Lerner and Tetlock 1999; Lindkvist and Llewellyn 2003). Gelfand et al. (2004:136) argue that cultural forces for accountability are found at multiple levels in organizations and that one of the basic ways that cultures vary is in the nature of their accountability systems. In addition, De Langhe et al. (2011) and Lerner and Tetlock (1999) note that accountability can be implemented in at least two ways. It can be based on the outcome of the individual's or group's decisions and actions (outcome accountability), the process that led to the decisions and actions (process accountability), or a combination of both. Research shows that a focus on process accountability leads to superior judgment quality in a variety of tasks and that a focus on outcome accountability can have adverse effects on performance (De Langhe et al. 2011; Jermias 2006).<sup>35</sup>

<sup>35</sup> De Langhe et al. (2011) note that the reasons for outcome accountability's negative effect on judgmental or decision performance are poorly understood. However, based on indirect evidence, they suggest that it may be due to an increase in decision stress and a narrowing of attention. The beneficial effects of process accountability are thought to be due to greater attention to the problem, better encoding and retrieval of information, and more balanced use of available information.

In leadership and personal roles, accountability refers to the acknowledgement and assumption of responsibility for one’s own actions and decisions, for the actions and decisions of those within one’s scope of responsibility/authority, and for the consequences that result from them. The organizational literature distinguishes between different forms of accountability (organizational, group, leadership/management, professional, personal/individual); between process and outcome accountability; and between accountability structures and requirements and “felt accountability” by individuals (De Langhe et al. 2011; Sinclair 1995; Hochwarter et al. 2007, 2003). An individual’s perceptions about his or her role in the accountability system are important. Indeed, accountability is often defined and assessed in terms of the participant’s perceptions.<sup>36</sup> Much of the research on accountability in organizations focuses on felt accountability and how it affects and is affected by attributes and behaviors of co-workers, supervisors, and the individual themselves (Gelfand et al 2004; Hall and Ferris 2011; Frink and Ferris 1999; Frink and Klimoski 2004, 1998).

As shown in Figure 3.7, accountability involves social exchange. Entities (individuals, groups, organizations) can be accountable to a number of different entities, including to themselves (self-referential). In organizations, accountability has a reciprocal quality—each party is both held accountable by the other and holds the other accountable to them. Because of power differences between individuals in organizations, these relationships are often asymmetric.



**Figure 3.7.** Multiplicity of Accountability Relationships

<sup>36</sup> For example, Gelfand et al (2004:137) define accountability as “the perception of being answerable for actions or decisions, in accordance with interpersonal, social, and structural contingencies, all of which are embedded in particular sociocultural contexts.”

The state of accountability in a group or organization is affected by the nature of the accountability structures and requirements, the nature of these relationships, the perceptions and expectations of the participants, and by the extent to which those expectations are met by participant behavior. Frink and Klimoski (1998) refer to this as the group's or organization's "accountability web" or system. Issues of trust, communication, and fairness affect perceptions and behaviors regarding accountability (Erdogan et al 2004).

The experience of being held accountable for one's decisions and actions influences motivation, conscientiousness, and work performance, although the relationship between accountability and performance is often complicated (Frink and Ferris 1999; Hall and Ferris 2011; Hochwarter et al. 2007; Tetlock 1992; Tetlock et al. 1989). A variety of moderators and mediators can affect the relationship between felt accountability and job performance; between accountability and leadership/management authority (Hall et al. 2007; Itoh et al. 2008); between accountability and trust (Ammeter et al. 2004); accountability and blame (Catino 2009, 2008; Johansen 2008); and accountability and organizational climate (Beu and Buckley 2004).

The mechanisms by which these effects occur are generally poorly studied and understood. An ongoing challenge has been to identify where the locus of responsibility for the factors affecting safety reside within an organization, and hence, how to make appropriate accountability assignments. The assumption is that in organizations with positive safety cultures, individuals have a sense of personal responsibility for the safe operation of the facility, their own safety, and for the safety of their co-workers, and the public. It is also assumed that this sense of personal responsibility is positively reinforced by attention to, evaluation of, and consequences for individuals' safety-related decisions and behaviors. This reinforcement could come from personal values and awareness, co-workers, supervisors, managers, and the broader society. Tetlock (1985a, b) emphasizes that accountability can motivate mindfulness, attention, and self-critical information processing. Reinforcing the sense of accountability and fairness is one benefit of after-event reviews that address both successes and failures (Ellis et al. 2006).

Assessing accountability in an organization involves identifying who is held accountable for what and by whom (i.e., who is answerable to whom about what) as well as understanding the direction and strength of those connections to (Gelfand et al. 2004).<sup>37</sup> Lack of alignment in the accountability systems within an organization and mismatches between the formal structures of accountability and the accountability system as perceived by the participants can create a variety of communication, motivation, and behavioral problems that can affect safety performance. At an individual or group level, mismatches in perceptions of accountability can create similar problems. The safety culture assessment should be able to identify and provide the basis for interpreting the reasons for and consequences of these problems.

### **3.3.3 Respect and Procedural Fairness**

The nature and dynamics of respect in social interactions are not well researched, despite widespread recognition that respect plays an important role in everyday and organizational life (Clarke 2011; Dillon 2010). Being respected and showing respect for others is consistently identified as an important characteristic of leaders and leadership and an important factor in social interactions, organizational communication, job satisfaction, and worker performance

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<sup>37</sup> The strength of an accountability connection is measured in terms of its clarity (in terms of the standards and expectations, including consequences of failing to meet those standards and expectations) and pervasiveness (i.e., the number of rules and obligations that one entity has to the other) (Gelfand et al. 2004).

(Clarke 2011; Colwell 2007; DeLellis 2000; DeLellis and Sauer 2004). The concept of respect is embedded in some of the values Americans consider most important, including social recognition (respect, admiration) and obedience (dutiful, respectful) (Rokeach and Ball-Rokeach 1989).

Respect is variously described as “a mode of behavior, a form of treatment, a kind of valuing, a type of attention, a motive, an attitude, a feeling...” (Dillon 2010:3). Respect always has an object, that is, respect is always directed to, felt about, or shown for some object (which may be a person). However, the “respector” is always a person. To respect something is to pay attention to it, to pay heed to it, and to reach a subjective judgment that the object possesses valued qualities. An individual demonstrates this attention and favorable judgment in the way he or she interacts with and treats the object (DeLellis 2000; Dillon 2010). Respect is also divided into appraisal respect, which is given to those perceived to have valued attributes in a particular, relevant domain, and recognition respect, which acknowledges the general worthiness of the other (van Quaquebeke 2011).

The specific ways that respect is conveyed in interactions among people, known as interpersonal respect, is culturally determined and can vary from one group to another. Langdon (2007) identifies five primary ways that interpersonal respect is conceptualized and conveyed:

- social rules;
- equality;
- caring;
- social power; and
- personal attributes.

Perceptions of respect affect social interactions in organizations (Finkelstein 2008). Perceptions of respect affect an individual’s sense of belonging, identity, and social reputation. Consequently, the desire to attain and retain respect can be an important motivation (De Cremer and Tyler 2005; Sleebos et al. 2007). Perceptions concerning respect also affect individuals’ commitment to and affiliation with groups or organizations, and consequently affect team and organizational performance (Clarke 2011; De Cremer 2002; Ellemers et al. 2004), although the experimental evidence measuring these effects is limited. However, the perception that one is disrespected, especially by leaders and other individuals or groups relevant to the individual, can lead to anger, withdrawal, or retaliation (Colwell 2007; Miller 2001). Respect is considered central to the influence leaders exercise over followers and to the character of leader-member exchanges (Clarke 2011; van Quaquebeke 2011).

The safety literature focuses primarily on the importance of the respect relationship between leaders, managers, and supervisors on the one hand and workers on the other. Studies of respectful leadership focus on identifying the attitudes and behaviors of leaders that signal to subordinates that they are respected, and valued, regardless of their position in the organizational hierarchy. Sutcliffe (2011:138) emphasizes the importance of respectful interaction and heedful interrelating to create the communication, exchange of information, and learning necessary in HROs.

Respectful interaction in this framework follows three moral norms:

1. Individuals respect the reports of others to the extent that each individual is willing to base his or her beliefs and actions on them (i.e., trust in others).
2. Individuals report what they perceive honestly so that others may use their observations to come to valid beliefs (i.e., they are honest).
3. Individuals respect their own perceptions as well as the perceptions of others, which leads to an ability to integrate perceptions into a socially shared perception without deprecating anyone's views (i.e., self respect).

Heedful interrelating is "a social process through which individual action contributes to a larger pattern of shared action and in which individuals understand how their actions fit into the larger action" (system perspective). Another recommendation is to encourage individuals to develop "conceptual slack" – a divergence in team members' analytical perspectives and a willingness to question what is happening, rather than feigning understanding.

Sutcliffe (2011:142) recommends institutionalizing the use of the STICC protocol as a way to reinforce mutual respect and mindfulness and create richer communication in an organization:

- **S**ituation (here's what I think is going on);
- **T**ask (here's what I think we should do);
- **I**ntent (here's why);
- **C**oncern (here's what I think we should keep our eye on); and
- **C**alibrate (now, talk to me).

Perceptions of respect in organizations are closely related to perceptions of procedural fairness (De Cremer 2002; Ellemers et al. 2004; Miller 2001).<sup>38</sup> Fairness is a core value in American culture. Perceived fairness of treatment often has high salience to organizational members. Fairness of treatment is often interpreted as an indicator of social status and respect. Unfair treatment signals disrespect and low status and can adversely affect an individual's sense of self-esteem (Koper et al. 1993; Lind and Tyler 1988). Consequently, perceptions of both distributive and procedural justice influence individual's satisfaction in situations of inequality or relative deprivation (Miller 2001) and affect the level of organizational citizenship behavior individual's exhibit.<sup>39</sup> Organizational citizenship behavior, in turn, affects organizational performance. Indeed, many safety culture traits depend upon workers voluntarily and consistently taking actions (such as communicating safety information, intervening to correct safety errors, maintaining high levels of vigilance, exhibiting personal accountability) for the benefit of the organization but for which they do not receive any explicit reward.

The more thoroughly the nature and dynamic relationships among these building blocks of culture are understood and described, the better informed the safety culture assessment, intervention plan, and evaluation can be.

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<sup>38</sup> Fairness and justice in social interactions is often analyzed in terms of distributive justice (the fairness of the outcome of resource distribution among recipients) and procedural justice (the fairness of the methods, mechanisms, and processes used to determine outcomes) (Miller 2001:529).

<sup>39</sup> Organizational citizenship behavior is defined as "those organizationally beneficial behaviors and gestures that can neither be enforced on the basis of formal role obligations nor elicited by contractual guarantee of recompense. Organizational citizenship behavior consists of informal contributions that participants can choose to proffer or withhold without regard to considerations of sanction or formal incentives" (Organ 1990:46).



## 4 Change and Change Management

This section provides an overview of some of the theories of individual and organizational change and change management (i.e., intentional, directed change) that form the basis for the design of intervention programs to strengthen safety culture. The primary interest in this report is on change that results from an intentionally initiated, structured intervention at the organizational level. However, these planned interventions may need to take into account other changes that are occurring because of ongoing, dynamic interaction processes between the organization and its external environment and within the organization itself. In addition, they may need to take into account self-directed change efforts initiated by individuals and work groups. Planned interventions will also benefit from familiarity with some of the most important and useful theories about individual and organizational change. Past experience shows that many organizational change initiatives are undertaken without thoughtful consideration of alternative strategies (Kotter 1998).

### 4.1 Types of Change Theories

There are many theories about individual, group, and organizational change—why change occurs, how the change process proceeds, what conditions are necessary for the changes to be incorporated and sustained, and what consequences result (Cooperrider and Whitney 2005; Dooley 1997; Hage 1999; Haveman 2000; Kezar 2001; Miner 2003; Morgan 1997; Sackmann et al. 2009). Much of social science research is focused on gaining a better understanding of the causes of change, the mechanisms by which change occurs, and how interactions between different levels in a social system (individual, dyad, group, organization, society) affect and are affected by the change process. Several change theories have been particularly influential and are in frequent use. Theories about change at the individual level underlie many of the strategies for change at the organizational level. When designing or evaluating interventions, it is important to be conscious of the change model being applied and to ensure that it is appropriate for the organization, the context, and the change to be achieved.

Bennis et al. (1985) in their classic *The Planning of Change* identify three different strategies that reflect the different theories about available mechanisms for inducing individuals to change:

- **Educative/empirical-rational strategies.** These are based on theories that individuals, guided by reason, will use some rational calculus of self-interest to determine needed changes in behavior. Knowledge is a major force for change and source of power for inducing change in these strategies.
- **Normative/persuasive strategies.** These are based on theories that individuals are guided by internalized meanings, habits, and values. These strategies emphasize the importance of balancing knowledge about technologies and systems with knowledge and understanding of non-cognitive determinants of behavior, including processes of persuasion, affiliation, and collaboration.
- **Power/coercive strategies.** These strategies emphasize political and economic sanctions and regulatory strategies as ways to amass political and economic power behind change goals. These strategies employ nonviolent protests, use of political institutions, and manipulation of the alignment and composition of the power-elite to accomplish change.

Meyer et al. (1990) suggest that mimetic strategies, which involve the provision of examples and models to facilitate and promote change, should be added to this list.<sup>40</sup> These strategies would include the very important role of formal and informal leaders in modeling the desired behavior.

Kurt Lewin (1943) developed the Force Field Analysis, which Schein (2010) recommends for use in evaluating and designing cultural change in organizations. This change analysis theory focuses on examining the dynamic interactions between forces encouraging and reinforcing change toward a goal and forces blocking change toward that goal. It reflects a recognition that change in social systems is multi-faceted and complex, involving individual motivation, organizational processes, etc.

Stage theories are another influential approach to change. Stage theories posit that change occurs in an established sequence. Included in this category of approaches is Lewin's (1947) Three Stage Change Theory, in which stage 1 is "unfreeze;" stage 2 is "move/change;" and stage 3 is "refreeze." This theory is widely used in educational and training programs, and is also recommended by Schein (2010) as an important strategy for culture change initiatives.

Subsequent researchers have elaborated the three-stage theory into a number of additional substeps. For example, Prochaska et al. (2008:98) proposed the following stages for individuals undergoing changes in habits and addictions (each stage includes the potential for relapse):

- precontemplation (interventions include encourage rethinking of target behavior, encourage self-analysis/self-awareness, and introspection; explain risks and consequences of behavior; highlight prevalence of change and norms and practices);
- contemplation, characterized by ambivalence, conflicted emotions (interventions include encouraging/assisting weighing pros and cons of change, identify barriers to change and how they might be overcome);
- preparation, which may include experimenting with small changes, becoming better informed (interventions include making the action of change more specific and concrete, establishing goals, developing a plan of action, and identifying motivating reinforcements)
- action (interventions include rewarding success, providing social support, reinforcing motivating factors);
- maintenance (interventions include coping strategies to deal with temptation, avoiding temptation, and rewarding successes); and
- relapse (interventions include identifying triggers that led to relapse and barriers to success, reaffirm goals and intent).

By identifying the specific stages through which an individual, group, or organization must transition on the way to the desired goal, these theories aid the design of interventions and intervention evaluations. They are widely used in health behavior and health education programs. A number of life cycle or maturation stage theories have also been found useful in understanding some types of change (Filho 2010). In the safety culture arena, Cooper (2001) developed a stage theory of safety culture development in the oil and gas industry, in which he posited that as these organizations undertake development of a safety culture, they progress

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<sup>40</sup> This is consistent with Bandura's (1978) Theory of Social Learning, which emphasizes the importance of demonstrations and role modeling in learning and self-efficacy.

sequentially from pro-forma/mechanistic compliance through a number of stages to a generative safety culture.

Sackmann et al. (2009:524), based on a review of the literature on strategic change by Rajagopalan and Spreitzer (1996), Clegg et al. (2005), and Tsoukas and Chia (2002), identify four perspectives on strategic change in organizations that affect how the change process is viewed, managed, and measured. These four perspectives are:

- rational—organizational change is viewed as a singular event designed to affect financial performance that is a planned, sequential, process in which the external environment directly affects the strategy;
- learning—organizational change is viewed as an iterative process of change in personnel, organizational structures, and processes in which both the external environment and the organizational context affect the strategy and attention is given to managerial processes related to organizational change;
- cognitive—organizational change is viewed as an iterative process of change in ideology and theories in use in which managerial cognition is an important antecedent of change and a distinction is made between evolutionary and transformative change; and
- organizational becoming—organizational change is viewed as constant, with interpersonal beliefs, relations, and actions in a constant state of flux that does not reach an equilibrium because change is inherent in human behavior, in sense making, and in the process of organizing.

At the same time, Sackmann et al (2009:524) conclude that for change to be sustainable, the change efforts need to lead “toward a learning organization that is capable of continuous self-reflection and learning, supported by a collectively shared vision and flexible structures and processes.” Consequently, change efforts usually need to address multiple aspects of the organization simultaneously, including strategy, structures and processes, managerial systems, leadership, and culture (Beer and Nohria 2000).

Reflecting yet another framework for organizing ideas about change, Kezar (2001) identifies six types of change models in her expansion of van de Ven and Poole’s (1995) typology: 1) evolutionary; 2) teleological; 3) life cycle; 4) dialectical/political; 5) social cognition; and 6) cultural. Table 4.1 provides a summary of some of the key differences among these change theory categories.

As revealed by this discussion, change is variously seen as either pushed by problems or pulled by visions or goals; as purposive and volitional or inadvertent and emergent; as a one-time event or a continuous process. It is never seen as easy or simple.

When designing an intervention, it is important to use a change model that is appropriate for the organization, the context, and the change to be achieved. In addition, as discussed in Chapter 6, those designing interventions to accomplish planned change in organizations need to be clear about the change model they are adopting and how it affects the particular change mechanisms to be applied. The appropriateness of the change model and how coherently the proposed intervention reflects that model should be assessed as part of the intervention evaluation.

**Table 4.1. Types of Organizational Change Theories and Models**

	<b>Evolutionary</b>	<b>Teleological</b>	<b>Life Cycle</b>	<b>Political</b>	<b>Social Cognition</b>	<b>Cultural</b>
Impetus or driver of change	Response to pressures from the external environment	Leadership driven; response to pressures exerted from within	Natural growth and transition, sometimes guided by leader's actions	Response to internal dialectical tensions involving power, values, norms, goals	Response to cognitive dissonance, learning	Response to changes in the human environment/basic assumptions, worldview, values
Change process	Adaptation, not planned/intentional; typically slow and gradual, though sometimes punctuated by rapid change	Planned, purposeful, sequential	Natural progression through stages, sometimes facilitated by interventions such as training and motivation	Negotiation, competition, power exertion	Learning, altering paradigms or frameworks/lens	Leadership and socialization, modification or substitution of assumptions, worldviews, symbols
Change outcomes	New structures and processes that modify roles and relationships	New structures and processes, sometimes including new organizing principles and members	New stage, new organizational identity	New organizational ideology, modified power structure	New frames and perspectives	Modified culture
Key metaphor		Changemaster	Maturations	Social movement		
Example theories/models	Resource dependency; strategic choice; social ecology	Organizational development, strategic planning, reengineering, TQM	Developmental and aging models	Marxist theory; bargaining;	Sensemaking; single and double-loop learning	
Criticisms	Lack of emphasis on goals and intentions	Overly straightforward and linear, inability to explain transformative (second order) change	Only applicable to a subset of entities and types of change	Little guidance for leaders; lack of attention to external environmental pressures	Underestimates difficulty of coordinated change and the role of power and emotion	
Benefits	Systems approach; attention to external pressures	Focus on analysis, planning, and empowering change agents	Attention to continuity, sequencing and temporal dimension of the change process	Draws attention to power dynamics and the influence of coalitions and relationships	Emphasis on individuals; clarifies how habits and attitudes can be barriers to change	Draws attention to deeply held and embedded assumptions that are often not fully recognized or understood

Source: Based on Kezar (2001:Appendix 1)

## 4.2 Individual Change and Change Management

Because individuals can change and be changed in many ways, there are many theories of individual change. Of primary concern for organization safety and safety culture interventions are theories of behavioral change. Although safety culture is an organizational rather than an individual attribute, interventions designed to change safety culture often rely on changing the behavior of individuals, including leaders. In addition, research shows that executing a behavior or participating in collective practices, particularly if repeated over time, influences subsequent behaviors, values, and cognition at an individual level. If an individual executes a behavior or practice repeatedly, it can become a habit. If a number of individuals execute a new behavior or practice repeatedly, it can lead to institutionalization of that behavior or practice at managerial, organizational, and societal levels (Hopkins 2002; Reason 1997; Montaña and Kasprzyk 2008; Weick and Sutcliffe 2007). This institutionalization does not always occur, however. Studies have also shown that behaviors and collective practices that are conducted on a pro forma basis without commitment (i.e., are seen as “lip service,” “going through the motions,” or failing to “walk the talk”), often do not alter values and cognition, although they may become commonplace (Kouzes and Posner 2007).

“Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behavior is learned observationally through modeling: from observing others one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action” (Bandura 1977).

### 4.2.1 Bandura’s Social Learning and Self-Efficacy Theories

Albert Bandura (1977) developed two very influential theories. One is the Social Learning Theory, which argues that people can and do learn behaviors and information by observing others. The other is the Self-Efficacy Theory, which addresses the sources and consequences of individuals’ beliefs about their capabilities to exercise control over their own functioning and events that affect their lives.

The Social Learning Theory posits that:

- People can learn through observation, using any of three basic learning models—active demonstration, verbal instruction, symbolic demonstration (e.g., through movies, books, etc.).
- Internal mental states are an essential part of this learning process, including intrinsic reinforcement (e.g., pride and satisfaction in learning, sense of accomplishment).
- Not all learning results in a change in behavior.

Observational learning and modeling to support observational learning involves the processes of attention, retention, reproduction, and motivation. Efforts to improve the effectiveness of observational learning therefore focus on ways to enhance each of these four components of the learning process.

The Self-Efficacy Theory (Bandura 1977, 1994) introduced a focus on individuals’ beliefs about their capabilities to exercise influence over events that affect their lives and the factors that

affect those beliefs. Bandura defines self-efficacy as “the conviction that one can successfully execute the behavior required to produce the outcomes.” Self-efficacy beliefs affect how people think, feel, motivate themselves to take action, and behave. A strong sense of self-efficacy leads people to approach difficult tasks as challenges to be mastered rather than as threats to be avoided. This leads them to set higher goals, maintain a strong commitment to their goals, recover their sense of efficacy quickly after failures or setbacks, and seek ways to further enhance their capabilities. The Self-Efficacy Theory has been widely used in the design and testing of intervention strategies and to explore the sources of self-efficacy, which include: 1) mastery experiences; 2) vicarious experiences provided by role models; 3) social persuasion; and response to somatic and emotional states (for example stress, positive moods, etc.). Self-efficacy considerations are important in designing organizational policies concerning, for example, accountability and work processes.

#### **4.2.2 Tetlock’s Social Contingency Model**

Being held accountable affects behavior in complex ways. “Accountability of conduct is a sociocultural adaptation to the problem of how to coordinate relationships among individuals who are capable of observing, commenting on, and controlling their own actions” (Tetlock 1992:337). Consequently, although a case can be made that accountability of conduct is universal, “the specific norms and values to which people are held accountable vary dramatically from one culture or time to another” (p. 337).

People are typically motivated to seek the approval and respect of those to whom they are accountable in order to enhance or protect their social image or identity and/or their self-image, or to acquire power and wealth or other resources. Consequently, accountabilities elicit coping strategies that are influenced by these motivations, including adopting the position/behavior likely to gain this approval/respect (the acceptability heuristic), which itself is influenced by how clearly and when the individual knows the criteria for judgment. After an individual has irrevocably committed to a course of action, an effort is likely to be made to defend that action.

#### **4.2.3 Ajzen’s Theory of Reasoned Action and Theory of Planned Behavior**

Ajzen’s (1991) the theory of reasoned action can be summarized as follows:

- Behavior is determined by the intention to engage in the behavior.
- Intention is determined by attitude toward the behavior and the subjective norm to which the attitude is related.
- Attitude is determined by behavioral beliefs and evaluation of the likely outcomes of a behavior.
- Subjective norms are determined by the normative beliefs of the person and the motivation to comply with the relevant actions.

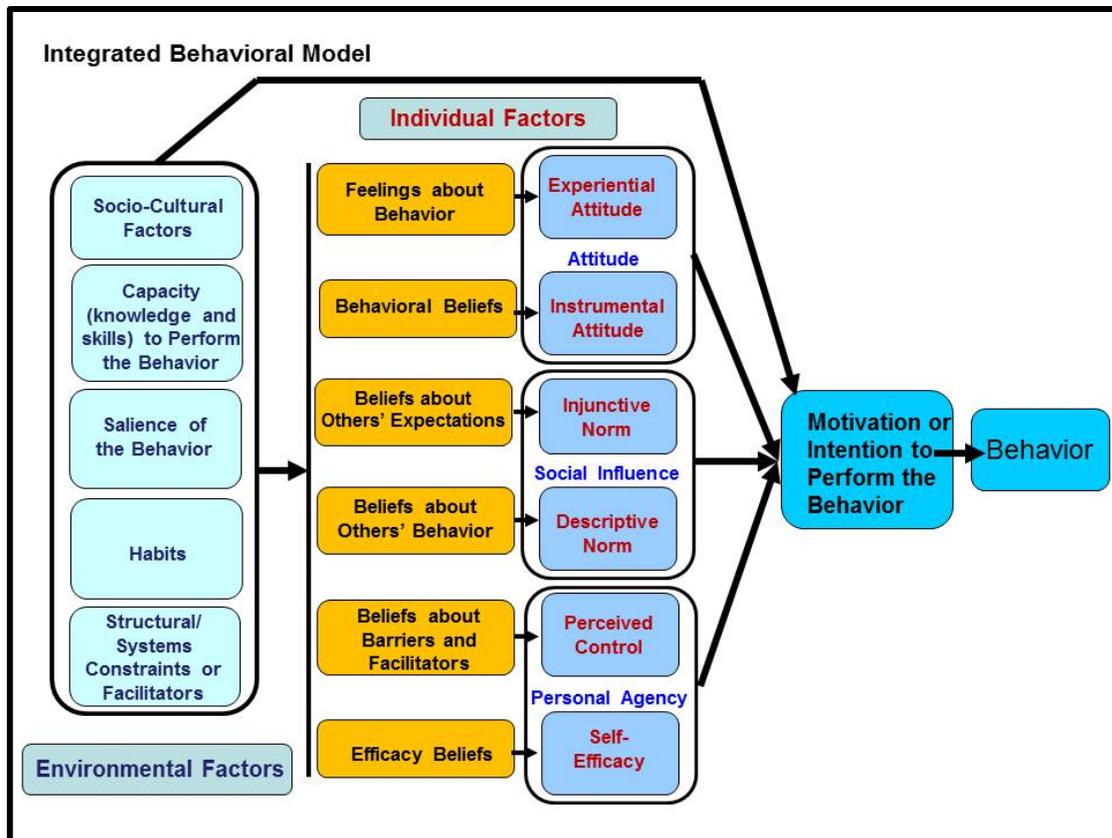
Many believe that this theory provides a complete theory of voluntary behavior. However, critics argue that it is more appropriately seen as a theory of the immediate causes of voluntary action.

In part because of this criticism, Ajzen proposed an alternative theory of planned behavior that enlarged the Fishbein-Ajzen model (Ajzen, 1991). Ajzen contends that the theory of reasoned action is adequate for nonhabitual behaviors that are easily executed by almost everyone without special circumstances but the theory of planned behavior should be used when behaviors are more difficult to execute, and when a person needs to take control over additional resources in order to act. The theory of planned behavior, includes a variable labeled "perceived

behavioral control" (defined as a person's perception of how easy or difficult it would be to perform the action), to address this issue.

#### 4.2.4 Montaña and Kasprzyk's Integrated Behavioral Model

The integrated behavioral model is based on extensive empirical research, builds on and integrates elements of preceding models, and illustrates the complex relationship factors that need to be taken into consideration when designing interventions. It is summarized in Figure 4.1.



Source: Montaña and Kasprzyk (2008) and personal communication

**Figure 4.1.** The Integrated Behavioral Model

This model is described in some detail because the project team believes that it provides a framework that can be usefully applied to the design and evaluation of safety culture interventions.

In the integrated behavior model, behavior results from motivation and intention to perform the behavior, but this in turn is contingent on a number of recognizable variables. These include:

- Attitudes—the individual's attitude toward the behavior. It is composed of an instrumental attitude (the person's overall favorableness or unfavorableness toward performing the behavior), and an experiential attitude (which reflect the person's emotional response to the idea of performing the behavior). Instrumental attitudes are determined by beliefs

about outcomes of behavioral performance. Individuals with a strong negative emotional response to a behavior are unlikely to perform it.

- Perceived norms/social influence—the social pressure the person feels to perform or not perform the behavior. This includes consideration of the injunctive norm (the combination of beliefs about what others think one should do and motivation to comply with the norm) and the descriptive norm (perceptions about what others in one's social or personal network are doing). These variables are included to reflect the strong social identity in some work teams and groups.
- Personal agency—bringing one's influence to bear. This includes perceived control over behavioral performance (perceptions of the degree to which environmental factors make it easy or difficult to carry out the behavior) and self-efficacy (one's degree of confidence in the ability to perform the behavior in the face of various obstacles or challenges).<sup>41</sup>

Each of these variables is shaped by beliefs and emotions. Beliefs and emotions in this model are similar to the more basic levels of Schein's model of organizational culture. While subject to change, these beliefs typically characterize and are reinforced by significant subcultures within the organization or by the culture of the organization as a whole. When designing an intervention, or evaluating an intervention designed to enhance safety culture that depends on motivating behavioral change, it is important to consider each of the types of attitudes and beliefs that shape or constrain intention and motivation and the organizational factors that create and reinforce them.

The individual factors are themselves contingent on a number of variables whose effects are more indirect, labeled as environmental factors in the model. The model illustrates why, for example, stated policies and positions do not always have the same impact on the behavior of workers as does a leader modeling the desired behavior through concrete actions in the face of forced choices. It also illustrates why change may require interventions that address both environmental and individual factors.

Of special importance is the role of leadership in shaping behavior and facilitating or impeding cultural change. Leadership can have an impact at various places in Figure 4.1. For example, leaders, whether they are formal or informal, direct supervisors, middle managers, or senior managers, typically dominate the dialog within an organization concerning expected behaviors. As the figure indicates, behavioral expectations include not only what is communicated in the form of instructions, but also what an individual perceives and interprets from the behavior of leaders. Consistency between what is communicated in terms of behavior and performance across formal and informal leaders and across different levels of management is very important if the individual is to receive a clear message about behavioral expectations. Perhaps as important is consistency between the message and the behavior modeled by leaders. In cases where leaders communicate that safety is a priority but then make decisions that appear to the individual that safety is not a priority, the safety culture improvement initiative is not likely to be successful.

Leaders are also important in establishing beliefs about self-efficacy. In references to safety culture, leaders play instrumental roles in providing the resources (training, time, managerial support) required for individuals and teams to engage in such important safety behaviors as

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<sup>41</sup> For example, in a work environment, an individual's sense of self-efficacy could affect his or her perceived ability to question another worker's actions or decisions or to explain an alternative interpretation of a work situation.

learning from experience, problem identification and resolution, and communication of safety-related information. Leaders also promote a sense of self efficacy when they provide positive feedback regarding problem identification and resolution. Leaders who “kill the messenger,” preferentially ignore or challenge problem-identifying information, or fail to address problems brought to their attention, dramatically undercut safety culture improvement initiatives.

#### **4.2.5 The Relationship Between Individual and Culture Change**

The development of methods to measure brain structure and processes has shown that the human brain remains plastic throughout life. Research has demonstrated that repetition of particular behaviors, cognitions, and emotions shapes neural connections and pathways in the brain, thereby affecting subsequent behavior, cognition, and emotion. This research is clarifying the mechanisms that underlie the reciprocal relationship between the individual and culture and providing a clearer understanding of the links between individual and cultural change (Kitayama and Uskul 2011). This is an active area of research that is likely to provide a better understanding of how to design patterns of behavioral, cognitive, and emotional practice or repetition that result in predictable cultural changes (and vice versa) (Wexler 2008).

“...[R]ecent work on neuroplasticity has suggested that ... public patterns of behavior, over a number of repeated occurrences, are likely to cause systematic changes in neural connectivity of the brain.... It is thus reasonable to hypothesize that recurrent, active, and long-term engagement in scripted behavioral sequences (what we call cultural practices or tasks) can powerfully shape and modify brain pathways...” (Kitayama and Uskul 2011:421).

### **4.3 Organizational Change and Change Management**

The integrated behavioral model provides insights into the processes and challenges of organizational cultural change, which involves changing core beliefs, assumptions, norms, relationships, and behaviors. It illustrates why, as those advising on organizational change emphasize, that aligning change initiatives with the existing organizational culture greatly increases the likelihood that the change will be successful and sustainable (Quinn 1996; Schein 1996a; Weick and Quinn 1999; Sackmann et al. 2009). However, because the integrated behavioral model does not specifically include the role of the change agent, it provides little guidance on managing and leading planned interventions within the context of a formal organization.

Conversely, the literature on organizational change and change management typically focuses on the strategy and management of change rather than on the types of individual- and group-level change that are the goals of cultural change interventions; it therefore provides little guidance about the requirements of individual and group change processes. However, this literature is instructive about some of the management and leadership requirements of planned interventions in an organizational setting. Consequently, adding an organizational change management perspective to the integrated behavioral model can yield an approach that addresses multiple levels of the change process.

Organizational change involves multi-level changes ranging from individuals within the organization to work groups to the entire organization (Mylett 2010; Sackman et al. 2009; Yeung 1997). The organizational change literature typically reflects a management perspective and

focuses on the role of the change agent, or leader on interventions to modify the organization's design, strategy, and systems. Leadership, trust, motivation, engagement, and persuasive communication are the common core requirements for successful organizational change reflected in this literature. This literature emphasizes the high frequency with which organizational change initiatives fail and the importance of addressing cultural issues (Ijaz and Vitalis 2011; Jones et al. 2004; Kotter and Schlesinger 1979; Sackmann et al. 2009; Self and Schraeder 2009). Awareness of this high rate of failure is reflected in a focus on identifying and overcoming resistance to change, assessing readiness to change, and on how to implement change initiatives (Ford et al. 2008; Lamm and Gordon 2010).<sup>42</sup> A review of organizational development research conducted during the 1980s by Sashkin and Burke (1987) found "an intensifying focus on designing organizational cultures as a means of managing change" (Armenakis and Bedeian 1999:293). With some exceptions (Burke and Litwin 1992; Vollman 1996), the literature offers relatively little guidance on how to determine the appropriate targets for change or how to design initiatives that will accomplish the desired change in those targets. Consistent with Schein's observations, a meta-analysis conducted by Damanpour (1991) found that the congruency or fit between content, contextual, and process considerations in a change situation may be more important to success than the nature of the intended change (Armenakis and Bedeian 1999).

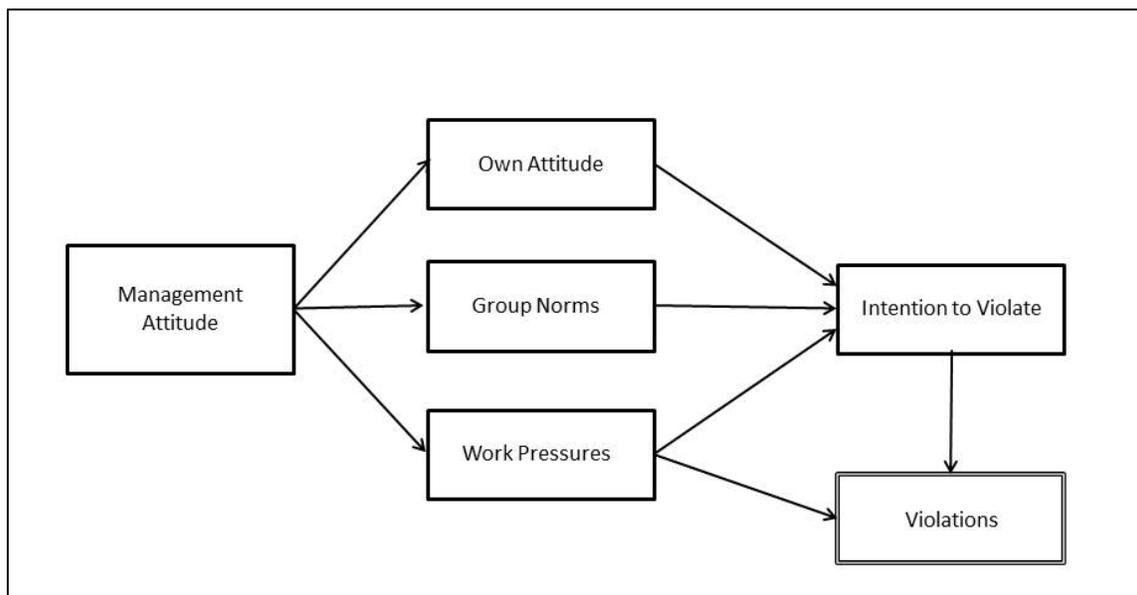
Change management efforts must be prepared to deal with what Wilkins and Dyer (1988:524) characterize as the basic question: "Why should I (or our small group) be part of the whole and contribute to it?" As Schein (2010) and Stevens and Fiske (1995) point out, people often fear and resist imposed change and, as with other organizational processes, must be motivated to engage and participate. Trust in leadership is consistently identified as one of the most important factors affecting individuals' response to change initiatives in organizations (Albrecht 2002; Oreg and Sverdik 2011). Engaging workers in the identification of needed changes and the development of interventions increases motivation to participate and support the change initiative (Pasmore and Fagans 1992). In a longitudinal study of strategic change, Sackmann et al. (2009) found that enhancing the ability of change agents, ranging from senior managers to supervisors, to reflect critically on their role, assumptions, and behavior in the change process increased the effectiveness and sustainability of the change initiative. Research is needed to gain a better understand the process of intentional organizational change, including sense making in different phases of organizational change, emotion-management and skill building requirements, and the role of different leadership styles on support for change initiatives.

As discussed above, motivations are energizing forces that shape perceptions and stimulate arousal, direction, and persistence of behavior (Iguisi 2009; Stevens and Fiske 1995). Leaders have the responsibility of providing the motivation and rationale for a planned change and for ensuring that the change initiative does not disrupt organizational activities in ways that are adverse to safety. For this reason, organizations and researchers alike have focused on the selection and training of leaders and managers and on helping them become effective implementers of change (Day 2001; Fiedler 1996; Jones et al. 2004; Pfeffer 1977; Senge 1990a,b).

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<sup>42</sup> Ford et al. (2008) point out that the emphasis on resistance and barriers to change reflects the management/change agent-centric perspective of this literature. They observe that this frequently leads to the view that change agents are unbiased observers rather than acknowledging that they are actually individuals with self-interests who may be causing what they label as "unwarranted" resistance through their own ignorance, incompetence, mismanagement, or poorly designed interventions.

In all theories of change, an important goal is to identify the mechanisms of change and the factors that serve as mediators and moderators<sup>43</sup> of the change process (Fairchild and McQuillin 2010). Understanding these factors improves the ability to design interventions that will have the desired effects with the target population. Fogarty and Shaw (2010), provide an excellent example of research examining the mediating role of individual attitude, group norms, and work pressures on an individual's intention to violate safety procedures. Figure 4.2 illustrates how these variables mediate the influence of management attitude on violations. More research is needed to clarify how the various traits of an organization's safety culture affect one another, are affected by different types of organizational and individual change, and affect organizational safety performance (Joe and Persensky 2010). The U.S. Department of Transportation has supported research examining some of these relationships (Morrow et al. 2010a,b).



Source: Fogarty and Shaw 2010:1457

**Figure 4.2.** Postulated Path Model Showing Mediating Variables

Researchers often discuss organizational change as either fundamental or transformational change or as transitional or transactional change. Transformational change is characterized as addressing “big picture” issues such as mission, strategy, culture, leadership, or coherence with the external environment. Transactional change is characterized as changes in the everyday “how things get done” issues such as structure, management practices, systems, motivation, needs, job fit, and work unit climate (Burke and Trahan 2000; Beckhard and Harris 1987; Bridges 1995).

The leaders of organizational change face special challenges, as they must often engage in personal change at the same time they are involved in designing and implementing the intervention program and in motivating and guiding others.

<sup>43</sup> A moderator is a variable that affects the direction and/or strength of the relation between an independent (or predictor) variable and a dependent (or criterion) variable (Baron and Kenny 1986)

### 4.3.1 Overcoming Barriers to Change

Consistent with Lewin's force field theory, design of interventions to strengthen an organization's safety culture need to identify and address potential barriers to change, including worker resistance. The integrated behavioral model provides a framework for doing this. In addition, the literature on change management has directed specific attention to identifying common barriers to the successful implementation of organizational change and general strategies for reducing and overcoming those barriers (Armenakis and Bedeian 1999).

Conflicting group identities, leadership behavior, inertia deriving from the organization's resource position, lack of shared vision, and myopia about interdependencies between the organization and its environment prevent many change efforts from being successful (Sackmann et al. 2009). Kotter and Schlesinger (1979) identify four main reasons for resistance to change:

- parochial self interest;
- misunderstanding (as a result of inadequate communication and information);
- low individual tolerance to change; and
- different assessments of the situation.

The individuals' personal orientation toward the change agent (especially their degree of trust in the change agent's integrity and competence and their identification and affiliation with the organization), the content of the change, and the manner in which the change is implemented also affect support of or resistance to change (Oreg and Sverdik 2011; Sackmann et al. 2009). The degree to which employees are involved as participants in the change initiative, and the extent to which they are confident that they have, or will be given, the skills needed to perform successfully in the changed organization are also important.

Proposed change strategies should therefore evaluate the potential for these barriers and should build into the change project plan specific mechanisms for overcoming them, where necessary. Several tools have been developed that are designed to assess an organization's readiness for change, although little evidence was found documenting their effectiveness (Lehman et al. 2002).

In this regard, Kotter and Schlesinger (1979) also identify six strategies for dealing with this resistance:

- education and communication;
- participation and involvement;
- facilitation and support;
- negotiation and agreement;
- manipulation and co-option; and
- explicit and implicit coercion.

Jermias (2006) argues that mechanisms are needed to prevent individuals from becoming overly committed to their initial judgments about change alternatives.<sup>44</sup> He found that making

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<sup>44</sup> Kahneman (2011) provides an excellent and comprehensive review of research on the psychology of judgment and decision making that emphasizes how quick and powerful initial impressions and judgments are, how they reflect a

individuals accountable for the negative consequences of their decisions relative to the change initiative leads to more objective evaluation of alternatives and reduces the inappropriate influence of prior decisions. Ford et al. (2008) caution that the literature on resistance to change is biased toward the perspective of change agents and their sponsors, and may therefore exaggerate the level and misrepresent the basis of resistance.<sup>45</sup> Dent and Cowley (2002) point to numerous instances in which employees support and work to implement change. Consequently, it is important that those planning interventions inform themselves about potential sources of both resistance and support for change, paying particular attention to what individuals' interpretations reveal about underlying assumptions, values, and ways of thinking.

Every directed change effort needs to be managed. This calls upon leadership, management, attention, effort, and communication skills. The organizational change management literature focuses primarily on approaches to assess the need for change and the organization's readiness for change; guidance for managers responsible for planning and implementing organizational change initiatives; and discussions of the consequences of organizational change management initiatives. In his 1996 book on *Leading Change*, Kotter sets out an eight stage process for leaders of organizational change that reflects the type of broad guidance provided in much of this literature:

- establishing a sense of urgency;
- creating the guiding coalition;
- developing a vision and strategy;
- communicating the change vision;
- empowering employees for broad-based action;
- generating short-term wins;
- consolidating gains and producing more change; and
- anchoring new approaches in the culture.

Reflecting this framework, Kotter (1996:4-14) identifies the following common errors by change leaders, which have contributed to the disappointing results of many change initiatives:

- allowing too much complacency and failing to establish a high enough sense of urgency among managers and staff;
- failing to create a sufficiently powerful guiding coalition and manifesting strong enough leadership commitment and support;
- underestimating the power of vision to help direct, align, and inspire actions by large numbers of people and provide coherence to the elements of the change initiative;
- under-communicating the vision by a large factor (10, 100, or even 1,000) and thereby failing to mobilize the understanding, participation, and support of large numbers of people;
- permitting obstacles to block the new vision leading to burnout and disaffection;
- failing to create short-term wins to maintain enthusiasm and momentum over the time it takes for real change to become established;

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variety of heuristics and biases, and how challenging it is to recognize and recalibrate initial judgments through more careful consideration.

<sup>45</sup> A similar bias is evident in the literature on diffusion of innovations, where a presumption was often made that adoption was the good and smart decision and that resistance reflected irrational and dysfunctional responses of innovation recipients.

- declaring victory too soon, before changes have become an established part of the new culture; and
- neglecting to anchor changes firmly in the corporate culture, which is the only way that organizational change becomes truly established.

Armenakis et al. (2001) suggest that the following influence strategies can be useful in enlisting support for change initiatives:

- persuasive communication;
- active participation by those affected;
- human resource management practices;
- symbolic activities;
- diffusion practices;
- management of internal and external information; and
- formal activities that demonstrate support for change initiatives.

The organizational literature includes many descriptions of approaches and guidelines for managing change in organizations, but few rigorous evaluations that clarify the role played by different program elements and processes. It is widely acknowledged that many planned organizational changes do not succeed. Resistance to the cultural changes involved and the difficulty of implementing and sustaining the necessary multi-faceted change initiatives needed at a sufficient level of intensity over a long enough period of time are among the reasons identified for this lack of success (Schein 2010). In addition, successful organization change requires understanding of the structures and processes that regulate communication and exchange across the multiple levels of the organization (Wahlström 2011).

Diagnosing the need for organizational change, designing an intervention to accomplish that change, and successfully leading an organization through the change process is widely recognized as one of the most critical and challenging responsibilities of organizational leadership (Battilana et al. 2010). Methods to improve the ability of organizations to implement intentional change have been a perennially popular topic in the organizational effectiveness and management literature. Lehman et al. (2002) offer an approach for assessing an organization's readiness for change that focuses on the motivation and personality behavior model, discussed above, which may provide a useful framework for such an assessment.

Leadership is consistently identified as a critical requirement for successful interventions, particularly those intended to make significant changes in organizational culture (Schein 2010; Hale et al. 2010a). This is for the same reason that leadership is identified as an important safety culture trait: leaders in formal organizations have the power and responsibility to set strategy and direction, align people and resources, motivate and inspire people, and ensure that problems are identified and solved in a timely manner (Kotter 1999; Thomas et al. 2005). In addition, organizational leaders, both corporate leaders and supervisors, play a disproportionately important role in establishing the organizational environment and culture through what Schein (2010) calls "primary and secondary embedding mechanisms." Primary embedding mechanisms are the most powerful and include:

- **the attention of the leader**, as demonstrated by what the leader pays attention to, measures, and controls on a priority and regular basis;

- **the reactions of the leader when under pressure**, as demonstrated by responses made during critical incidents and crises;
- **the criteria the leader uses to allocate scarce resources, rewards, and status** (including leader attention), as observed by those in the organization;
- **the criteria the leader uses to select organizational members for development or sanction**, as observed by those in the organization; and
- **deliberate role modeling, teaching, and coaching by the leader.**

These mechanisms are particularly powerful because members of the organization interpret them as demonstrations of enacted values. Consequently, these mechanisms are a primary focus of both safety culture assessments and proposed interventions. However, because they represent enacted values, leaders generally find them very difficult to change.

These general principles related to individual and organizational level change provide important insights into how to evaluate specific safety culture interventions. The following chapter provides a methodological context for applying these principles in a systematic manner.



## 5 Lessons from Initiatives to Create and Sustain Organizational Learning, Value, and Sustainability Cultures

The concern with development and maintenance of an organizational safety culture has several parallels in the organizational literature. Research on the cultural attributes of organizations characterized as learning, quality, and sustainable organizations and how these organizations and corresponding cultures are created, changed, and sustained can inform the assessment of proposed interventions to improve organizational safety culture. As Sutcliffe (2011) points out, high performing organizations of all types share many organizational and cultural characteristics. Indeed, many of the organizational and cultural attributes identified as key to an organization's safety culture—leadership, trust, accountability, continuous learning, worker engagement, and effective communication—are also considered key attributes of organizations seeking to become learning, quality, and sustainable organizations and to their particular cultures. This literature provides a basis for comparing how organizational culture is conceptualized, linked to organizational structures and processes, measured and assessed, targeted as a change objective, and used as a change mechanism when the focus is on learning, value, or sustainability rather than safety. The literature on learning culture and learning organizations is particularly pertinent because the NRC has identified “continuous learning” as a key safety cultural trait.

### 5.1 Description of Three Organizational Cultures and Organizational Types

#### 5.1.1 Learning Culture and Learning Organizations

The concept of a learning organization with a learning culture flourished in the 1990s, as part of the response to challenges in the marketplace and competition and changes in technologies. In addition to continuous learning by the individual members of the organization, learning organizations are characterized by an enhanced ability and willingness of individuals to apply their individual learning in the workplace and to share and transfer it to their coworkers (Wahlström 2011). Organizational learning typically encompasses the processes of knowledge acquisition, information distribution, information interpretation, and organizational memory (Huber 1991; Levitt and March 1988).

“With the advent of the post-industrial age, knowledge and learning have become the new form of capital” (Barrett 1995:48)

To capture and sustain the benefits from individual and team learning, learning organizations develop leadership that prioritizes and motivates the desired learning and sharing behaviors and systems that are effective in storing and disseminating this knowledge (James 2003). They also develop (or have) a learning culture.<sup>46</sup> Learning organizations and a learning culture encourage the practice of generative, or double loop, learning. Generative learning emphasizes continuous

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<sup>46</sup> Learning organizations are generally considered to require and draw upon a learning culture in the same way that high reliability organizations or safety-oriented organizations require and draw upon a safety culture. The literature on learning organizations and learning culture could be an ongoing source of information applicable to safety culture development and evaluation efforts.

experimentation and inquiry, and involves recognition, assessment, and consideration of one's own and others' assumptions and mental models (Senge 1990a; Argyris 1999).<sup>47</sup>

Much of the literature on learning organizations and learning cultures reflects an organizational perspective and specifically addresses the multi-level reality of organizational life by specifically considering requirements at the individual, group, and organizational levels, and emphasizing the importance of embedding learning at the system level (Dixon 1992). According to Senge (1990a,b), learning organizations demonstrate capability in five disciplines—systems thinking, personal mastery, questioning assumptions and mental models, building a shared vision, and team learning—that lead teams to develop three core learning capabilities (fostering aspiration, developing reflective conversation, and understanding complexity). Tsang (1997) points out that much of the literature on learning organizations and learning cultures is prescriptive—what to do to build one, what one should look like—but that careful empirical research that provides a clearer and more complete description of learning organizations and learning cultures.

### 5.1.2 Quality Culture, Total Quality Management, and Quality Organizations

Quality became a strategic tool for U.S. organizations in the 1980s as they struggled to compete with the lower cost, higher quality production of Japanese companies. Total Quality Management (TQM) was introduced as an integrated organizational strategy to improve quality at every level in the organization. It emphasized the role of senior management in establishing a priority on quality and management at all levels to implement quality systems and practices. W. Edwards Deming earned the title, “father of quality control,” from his work with Japanese companies to achieve this superior performance.<sup>48</sup> Deming was influential in shifting the focus of quality achievement from worker errors (which he showed accounted for only about 15 percent of quality problems) to process and system improvement. He emphasized that lasting improvement in quality within

“Studies have indicated that quality systems are likely to fail 18-24 months into the endeavour irrespective of the approach used. One of the common reasons for failure is the cultural position of the organization. If the quality system effort is inconsistent with the organizational culture, the effort will be undermined” (Viljoen and van Waveren 2008:1781)

<sup>47</sup> Adaptive learning focuses on solving current problems without questioning the framework that generated those problems

<sup>48</sup> Deming (1993) recommended a set of management practices that conform to the following 14 points, many of which are common to the recommendations made to improve organizational safety:

1. Create constancy of purpose for continual improvement of products and services.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier.
5. Improve constantly and forever every process for planning, production, and service.
6. Institute training on the job.
7. Adopt and institute leadership.
8. Drive out fear.
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations, and targets for the workforce; substitute leadership.
11. Eliminate numerical quotas for the workforce and numerical goals for management.
12. Remove barriers that rob people of pride of workmanship, and eliminate the annual rating or merit system.
13. Institute a vigorous program of education and self-improvement for everyone.
14. Put everybody in the company to work accomplishing the transformation; involve everyone in transformation.

an organization could only be accomplished through organizational change initiated at the highest levels (Deming 1993, 1986). Total quality management is addressed as a general philosophy of management, a system of management, and as a strategic commitment to continuous improvement and meeting customer needs (Gallear and Ghobadian 2004; Spencer 1994). Aspects of quality addressed in building a quality organization include conformance to specifications, fitness for use, value for price, follow-up, and support. Because of its focus on management and systems, those writing about total quality management and quality organizations, have focused primarily on organizational design and processes and on management practices, although the literature does include some articles focused on quality culture (Cameron and Sine 1999; Dean Jr. and Bowen 1994; Gallear and Ghobadian 2004; Harvey and Stensaker 2008). Kujala and Lillrank (2004) and Cameron and Sine (1999) provide insightful discussions about total quality management as a cultural phenomenon, by which they mean that quality is approached as a set of values, a general orientation, an organizational ideology, and a way of being, rather than as a set of tools or techniques. Because many organizations struggled in their attempt to become a quality organization and implement total quality management, this literature includes many studies and discussions focused on the challenges and barriers to successful and sustained change (Reger et al. 1994; Viljoen and van Waveren 2008).

### **5.1.3 Sustainability Culture and Sustainable Organizations**

Until recently, the management literature had not focused on helping organizations understand how to organize for sustainability (Shani and Mohrman 2011). Initially, the focus of the sustainable organization and sustainability culture initiative was on applying a systems approach to incorporate environmental/ecological as well as economic considerations into organizational goals, practices, and strategy. As the sustainability effort matured, the focus broadened to include consideration of human and social systems as well (Pfeffer 2009). More than the learning, quality, or safety initiatives, the sustainability initiative reflects a clear normative perspective. This has influenced how the motivational aspects of efforts to create sustainable organizations and cultures have been framed. Because sustainability, unlike learning, quality, and safety, was not an intrinsic or established organizational goal or desired attribute, considerable attention and effort was focused on convincing senior management and organizational leaders about the feasibility and benefits of building a sustainable organization. For this reason, the literature on building sustainable organizations and culture tends to be quite specific about the mental models, assumptions, metaphors, priorities, metrics, and norms of managers and business leaders that must be changed or enriched before the concept of a sustainable organization or culture can be understood and implemented (Mirchandani and Ikerd 2008; Pfeffer 2009).

An important evolution in the development of sustainable organizations was the development of the concept of the “triple bottom line,” i.e., organizations that managed simultaneously for profits, the planet, and people. As with safety and quality, the initial stages of the sustainability effort focused primarily on systems analyses, economic analyses, and organizational design (processes, organization and work design, system regulation, and continuous learning approaches), with relatively little attention to the cultural changes within the organization that would be needed for such an organization to operate effectively (Shani and Mohrman 2011). Consequently, the literature on sustainable culture is sparse. Continuous learning has consistently been identified as an essential attribute of sustainable organizations and a sustainability culture. A particular challenge for those attempting to help organizations become sustainable organizations and develop sustainability cultures has been to detect and overcome

management's temptation to make changes designed to avoid criticism and project an image of sustainability for public relations reasons rather than building a genuine commitment to the concept and vision of a sustainable organization.

## **5.2 Relationship Between Organizational Culture and Organizational Type**

The literature on learning organizations, total quality management and quality organizations, and sustainable organizations illustrates that debate over definitions is widespread and that organizational researchers frequently interchange the concepts of organizational type (learning organization, etc.) and the organizational culture that manifests the attributes of the organizational type (e.g., learning culture). Consequently, the literature frequently includes discussions of "how to build a learning culture" alongside discussions of "how to build a learning organization." In this literature, researchers often emphasize that strategies to create the organizational type and that type's culture require consideration of the existing broader organizational characteristics, including its organizational culture, and measures to accomplish adaptation of both (Lewis 1996a,b; Linnenluecke and Griffiths 2010; Viljoen and van Waveren 2008).

In these discussions, a particular culture is variously treated as a prerequisite for the creation of the corresponding organizational type, a consequence of the creation of the organizational type, or an integral component of the organizational type (Armenakis and Bedeian 1999; Gallear and Ghobadian 2004; Linnenluecke and Griffiths 2010; Prajogo and McDermott 2005; Viljoen and van Waveren 2008). In general, this literature focuses more on the organization and its functioning and management than on the specific attributes or traits of the corresponding culture (Eccles et al. 2011). Consequently, we found no literature on methods for assessing these cultures comparable to that which has developed for assessing organizational safety culture.<sup>49</sup>

In this literature, change and maintenance of these organizational types and their associated cultures are generally addressed from a management rather than a trait-modification perspective, although a number of articles explore the implications of other cultural models.<sup>50</sup> A criticism of the quality management and sustainability movements has been that organizations tend to focus more on the system requirements than on the human resources and cultural requirements of successful implementation (Linnenluecke and Griffiths 2010; Viljoen and van Waveren 2008).

In these discussions, a distinction is often made between the specific culture needed to create and sustain the desired organizational type and the broader organizational culture, indicating that cultures supporting particular organizational attributes are tacitly seen as cultures within cultures, i.e., cultural features specific to, and necessary for, particular types or subset of organizational behavior. A number of researchers emphasize the importance of alignment between subset culture and the overall organizational culture. The Canadian Business for Social Responsibility (2010) takes the opposite perspective and describes how to embed sustainability into an organization's culture.<sup>51</sup> Gallear and Ghobadian (2004) address quality culture

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<sup>49</sup> The assessment instrument developed to characterize learning organizations, including the organization's learning culture, is somewhat similar (Marsik and Watkins 2003; Song et al. 2009).

<sup>50</sup> The competing values framework (Quinn and McGrath 1985) and the Organizational Culture Inventory (Cooke and Szumal 1993) are two examples.

<sup>51</sup> The approach follows Galbraith et al's (2002) five-element framework for changing the culture of an organization, which includes: strategy, structure, processes, people, and rewards.

holistically, equating it with the organizational culture of an organization that is a quality organization.’

In addition, there is general agreement in this literature that organizations attempting to create or strengthen a particular organizational type or cultural subset need to pay attention to organizational design, which is defined as including both organizational components (leadership, culture, strategies, systems, structure, and knowledge workers) and their connections (James 2003; Lewis 1996a,b; Serrat 2009a). Viljoen and van Waveren (2008), for example, argue that leaders can create the desired values (and culture) by changing organizational design. Gallear and Ghobadian’s (2004) view is that by holding quality values and progressively implementing structures and processes that enable quality performance,<sup>52</sup> managers and organizational leaders can shape an organization and its culture into a quality organization with a quality culture. The literature is quite consistent in emphasizing the importance of recognizing that organizations are multi-level, dynamic systems whose elements are related in complex and multi-faceted ways, and that culture mirrors this dynamic complexity, despite its role in socializing individuals, maintaining stability, and resisting change.

### **5.3 Building and Sustaining Organizations of a Particular Type or with a Particular Culture**

The difficulty of transforming an organization’s culture and transforming an organization into a particular type, though widely recognized, has not deterred organizations from undertaking initiatives to change their organizations into learning, quality, and sustainable organizations (Weick and Quinn 1999).

““Leaders often apply band-aid fixes, such as teams, without implementing a change in their fundamental beliefs and organizational design” (James 2003)

Consequently, the literature on building and sustaining learning, quality, and sustainable organizations and their corresponding cultures is quite extensive, making a thorough review beyond the scope of this report. A prominent emphasis in this literature is description of the organizational type (culture), discussion of how and why this organizational type (culture) differs from other (often unspecified) organizational types (cultures), the drivers leading to the emergence of and desire for this type of organization (culture), and the benefits various attributes of this particular type (culture) confer on the organization. This section focuses on the subset of this literature that provides frameworks, identifies and evaluates intervention alternatives, and presents lessons learned from efforts to build and sustain learning, quality, or sustainable organizations and cultures. A frequent criticism of this literature is that recommendations for building these types of organizations or cultures are generic and untested, and do not adequately emphasize the importance of tailoring the approach to the specific culture and context of the target organization.

Watkins and Marsick (1993;1996;1997) emphasize that to create and sustain a learning organization and learning culture, attention must be directed to and change must occur at each

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<sup>52</sup> These structures and processes include teamwork, training and development, interdepartmental cooperation, channels to increase trust, and channels that help clarify goals and objectives across the organization. They consider these to be facilitators of culture change as well.

of three levels within the organization—individual, team, and organization.<sup>53</sup> They also argue that to implement an intervention effectively, methods must be available to measure progress toward the desired organizational characteristics. To this end, they have developed an assessment tool, a survey instrument designed to measure an organization's status on eight dimensions of learning (distributed across the three levels).

Garvin et al. (2008) identify three building blocks that are required to create a learning organization: a supportive learning environment; concrete learning processes; and leadership that reinforces learning.<sup>54</sup>

Argyris (1999b:6) issues a warning directed at the literature on building learning organizations, but that is applicable more broadly to efforts to create particular organizational types, including safety cultures:

Writers on the learning organization tend to focus on first-order errors, due to mistaken or incomplete action strategies and assumptions of the sort that practitioners ordinarily detect and try to correct. They tend to be selectively inattentive to second-order errors, which are due to the organizational designs that make people systematically unaware of the behavioral phenomena that underlie the production and reproduction of first-order errors. We refer here, for example, to defensive routines, mixed messages, taboos on the discussability of key issues, games of control and deception, and organizational camouflage....reflection on such phenomena and the theories-in-use that underlie them, is essential both to the task of explaining the limitations of organizational learning and to the design of interventions that can overcome those limitations.

As part of an intervention evaluation, members of organizations that had implemented the LearnSafe project, an initiative to create a learning organization, were asked to identify the issues that had occurred in the course of this effort (Wahlström 2011; Wahlström and Rollenhagen 2004). They identified the following nine clusters of issues and considerations, that presumably represent potential barriers to the success of this intervention:

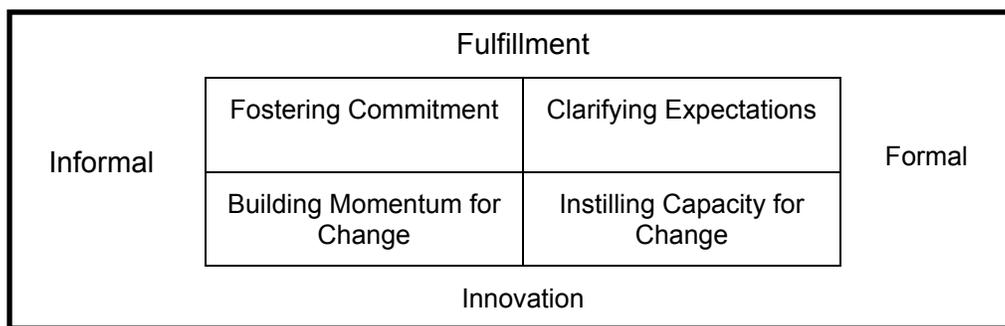
- objectives, priorities, and resources;
- formal systems and practices;
- attitudes and orientation of the workforce;
- corporate culture and traditions (including common language and cooperation);
- communication, guidance, and appraisals;
- maintaining touch and focus (including management support, realism and patience, work practices, and expectations and experience);
- openness and trust (including team spirit and willingness to change);
- work community (including expectations, feelings of security, acknowledgements, and involvement/participation); and
- encouragement and rewards (including critical thinking endorsed).

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<sup>53</sup> The learning organization/learning culture literature provides an articulation of what is needed at each of these three levels and how those collective change are integrated into an overall change in the organization and its culture.

<sup>54</sup> Leaders demonstrate this reinforcement by demonstrating a willingness to hear and consider alternative viewpoints; signaling the importance of allocating resources (time, effort, and money) on problem identification, knowledge transfer, and reflection; and by engaging in active questioning and active listening (Garvin et al. 2008).

Bertels et al. (2010) reviewed the literature pertinent to embedding sustainability in organizational culture and developed a framework for thinking about, developing, and deploying a portfolio of interventions strategies. Their review covers an inventory of interventions that have been proposed for building and reinforcing a sustainability culture.<sup>55</sup> Some of them have been demonstrated and evaluated. Their framework groups interventions along two dimensions. First, whether the intervention is intended to fulfill a current commitment or to find an innovative way to do things differently or better, and second, whether the intervention is undertaken informally or as a formal approach. Informal approaches tend to be practices that shape an organization's culture by modifying values and social norms through discussion, experience, or modeling of desired behaviors. Formal approaches shape behavior through modification or establishment of rules, systems, procedures, which can include codification, documentation, and reinforcement of values and behaviors that have emerged informally. A training curriculum is an example of a formal intervention. This framework places interventions into one of four quadrants: fostering commitment, clarifying expectations, building momentum for change, and instilling capacity for change, as illustrated in Figure 5.1. Bertels et al. (2010) recommend that interventions to build or change a sustainability culture should include elements from all four quadrants. This is consistent with Schein's (2010) observation that organizational change requires intervention in a number of dimensions simultaneously.



**Figure 5.1.** Framework for Organizing Cultural Interventions

Gallea and Ghobadian (2004) identified visible engagement and commitment by top management and leaders, development of a shared vision, worker participation and engagement, and teamwork as the conditions most important to the establishment of a quality organization and culture.

### 5.3.1 Points of Emphasis in The Literature

A number of recurring points are made in this body of literature. The following are illustrative of the conclusions and lessons learned from efforts to build learning, quality, and sustainable organizations and to understand their cultures. This list does not represent a systematic analysis of the literature's findings or representations, but demonstrates the type and range of factors or strategies considered noteworthy and important and to identify this literature as a potential source of information useful to those concerned with organizational safety cultures.

- Culture, and its associated mental models, and framings, affect the characterization and analysis of organizational types and cultures and therefore change and maintenance

<sup>55</sup> Sursack (2011) provides a review of processes and tools to build and strengthen an educational organization's internal quality culture that complements the Bertels et al. discussion. Many of the suggested intervention tools and activities are similar.

strategies; these biases are often difficult to recognize and address (Huysman 2000; Sackmann and Phillips 2004)

- Alignment with broader organizational culture and purpose
  - ▲ Learning organizations are strong egalitarian cultures because this facilitates continuous improvement and adaptation at all levels (James 2003).
- Management commitment and leadership, including visible modeling
  - ▲ In learning organizations, leadership is found at many levels and is focused on learning, teaching, and transforming the organization into a learning organization (James 2003). Leaders need to model the desired behaviors consistently and visibly. This is one of the most effective ways to convey commitment and sincerity (Gavin et al. 2008).
  - ▲ Quality management programs emphasize the importance of management commitment and a well-established strategy (Cua et al. 2001).
  - ▲ Generative learning and collective learning requires that leaders and managers trust and respect their workers. “Managers have a dual role in promoting learning both as members of and as representatives for the organization. This duality implies that their personal orientation can have a large influence as both facilitators and hindrances for organizational learning.” (Wahlström 2011:70).
- Creating a shared vision and goals
  - ▲ An important part of building a learning organization is creating a shared vision among the organizational members (Eisenberg and Goodall 2007; Senge 1990).
  - ▲ Creating a shared vision requires engaging workers and giving them a sense of participation in the development or change process.
- Intervening at the appropriate organizational level
  - ▲ According to Gavin et al. (2008), targeting initiatives at senior executives rather than managers of smaller departments and organizational units where critical organizational work is done reduces the effectiveness of efforts to create learning organizations.
- Standards and tools for assessment
  - ▲ Standards and tools for assessing the status of the organization and progress toward the achievement of a learning organization are needed so that managers can determine how their team’s behaviors (e.g., learning and transferring that learning to the members and work of the organization) are contributing to organizational goals Gavin et al. (2008).<sup>56</sup>
  - ▲ Lack of tools to measure status and progress disempower effective change initiatives (no useful information to inform decisions or feedback for motivation and learning) Gavin et al. (2008).
- Supportive environment and trust

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<sup>56</sup> Watkins and Marsick (1993,1996,1997) developed the Dimensions of the Learning Organization Questionnaire) to provide a basis for measuring an organization’s learning culture. The questionnaire has been validated at a number of organizations in a variety of countries (Yang 2003). Wahlström (2011) proposes a method for collecting and analyzing information from organizational participants concerning issues, barriers, and leveraging opportunities for organizational learning. Garvin et al. (2008) developed a survey for organizations to assess their status as a learning organization built on their three building block model (supportive learning environment, concrete learning processes; and leadership that reinforces learning).



information and would enable better design and implementation of interventions. Assembling and analyzing this information from the literature on safety, learning, quality, and sustainability organizations and cultures could be instructive.

## 6 Designing and Evaluating Targeted Interventions

This chapter describes methodologies for designing and evaluating targeted interventions. It focuses on the process of translating identified needs for change into interventions that incorporate scientific knowledge and logical thinking. It highlights the importance of clarifying the specific targets of change, the change model being applied, and the organizational resources need to implement the change. Documentation of this process, along with a description of the proposed intervention, would provide the information the NRC needs to evaluate how well the proposed intervention addresses the issues identified in the safety culture assessment.

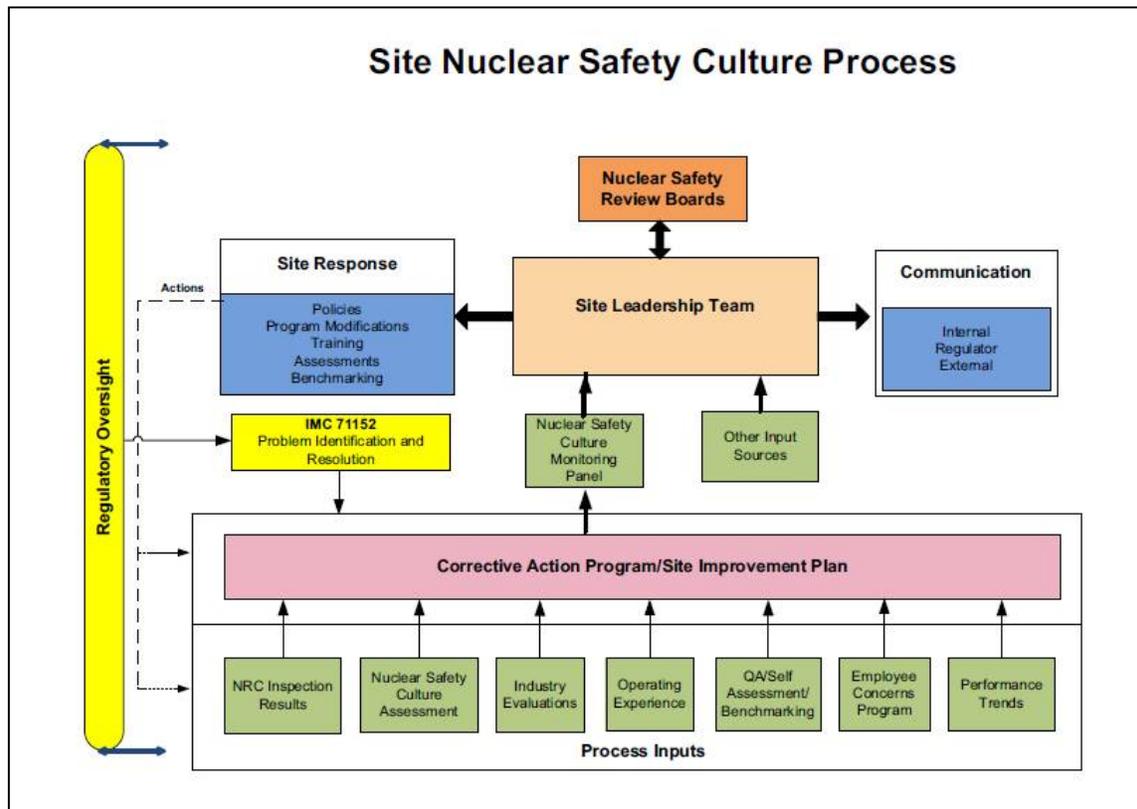
### 6.1 Interventions and Corrective Actions in the Nuclear Industry

Interventions are actions taken to change an individual, group, or organization, frequently in response to the identification of a problem, gap, or violation/nonconformance, or recognition of an opportunity or need for improvement. Interventions can vary in intensity, duration, scope, focus, purpose, and method. The literature on the design, implementation, and evaluation of interventions to address identified shortcomings in an organization's safety culture is sparse; there is more focus on creating a safety culture than on intervening to correct identified problems (Human Engineering 2005a,b).

The evaluation science literature provides useful guidance on how to formulate an intervention program and accompanying evaluation. An advantage of the evaluation science literature is its grounding in interventions designed to address complex cultural, behavioral, and social problems. Consequently, it emphasizes the importance of understanding and taking into account the complex and indirect nature of cultural and behavioral change and the need to think carefully about where and how to focus intervention efforts.

Another resource is the literature and organizational experience with quality management systems. Many organizations and regulators have responded to pressure for greater assurance of the consistent, high quality of products by implementing increasingly elaborate quality management systems that incorporate both corrective action and preventive action procedures, known as CAPA. For example, the International Organization for Standardization's ISO 9001 codifies a CAPA requirement (Muchemu 2006). Because corrective actions follow from the identification of a violation, failure, or problem, the corrective action process places a strong emphasis on clear specification of the problem, analysis of the root cause(s), and assignment of responsibility for specific actions or outcomes that are documented by an audit (U.S. Department of Energy (U.S. DOE 2006; Muchemu 2006). It would be relatively easy to incorporate the corrective action and CAPA processes into the process recommended by the evaluation science literature for designing and describing the planned intervention and developing an evaluation strategy as discussed below.

It is important that corrective actions to address an organization's safety culture are integrated and coordinated with that organizations Safety Management System (SMS). Figure 6.1 is a schematic representation prepared by the Nuclear Energy Institute (NEI) illustrating how this integration and coordination could be accomplished.



Source: NEI 09-07

**Figure 6.1.** NEI Description of Site-level Integration of Nuclear Safety Culture Assessment Information into the Overall Safety Management System

## 6.2 Designing Targeted Interventions and Their Evaluation

The U.S. Centers for Disease Control and Prevention (CDC), part of the Department of Health and Human Services) have developed an approach and a set of guidance materials to increase the effectiveness of intervention programs and the utilization of evaluation results. The CDC's utilization-focused framework is based on evaluation science, particularly the work of Michael Patton (2008). The CDC's six-step framework has been adopted widely (Donaldson 2007:12; CDC 1999)<sup>57</sup> and its method for program (intervention) description, which includes logic modeling is particularly pertinent to the safety culture assessment effort.

<sup>57</sup> The six steps are:

1. Engage stakeholders – those involved, those affected, and primary intended users;
2. Describe program – needs/problems addressed, expected effects/changes, activities undertaken, resources deployed, stage, context, and logic model;
3. Focus the evaluation design – articulate purpose, users, uses, questions, methods, and agreements;
4. Gather credible evidence – indicators, sources, quality, quantity, and logistics;
5. Justify conclusions – standards, analysis and/or synthesis, interpretation, judgment, and recommendations; and
6. Ensure use and share lessons learned – design, preparation, feedback, follow-up, and dissemination.

Patton, and the CDC approach, make a clear distinction between program evaluation and research. They emphasize the importance of focusing the evaluation on the questions and information that are most important to the program's most important stakeholders and on meeting the standards of utility, feasibility, propriety, and accuracy. The purpose of program evaluation is to determine how well the program was implemented and the extent to which it achieved its goals, and to provide information to stakeholders that they find useful in making decisions about the program. Nevertheless, the CDC emphasizes that the design of both the intervention and evaluation programs should be informed by available research. The CDC and the W.K. Kellogg Foundation (2004) have developed guidance materials (documents and webinars) and tools that Licensees and the NRC could use in developing, describing, and evaluating interventions to address weaknesses in a Licensee's safety culture identified through the assessment process. The following section describes this approach as elements of the program theory-driven evaluation approach of evaluation science.

### **6.2.1 Program Theory-Driven Evaluation Science**

Emerging as a specialty field in the social and organizational sciences in the 1970s, evaluation science focuses on helping stakeholders diagnose organization and social needs, design interventions, monitor intervention implementation, and design and implement an evaluation process to measure and assess the intended and unintended consequences that result as the intervention is implemented. Evaluation specialists often help with the design of interventions (Rossi et al. 1999).

With the exception of some aspects of public health, research to support the design of intervention programs is often sparse. To accommodate this, evaluators have developed a number of systematic approaches to intervention design. One of these is program theory-driven evaluation science, in which the design, conceptualization, and logic of a proposed intervention, the plan for its implementation, and its utility are analyzed from a variety of perspectives (Donaldson 2007; Chen 2005; Rossi et al 1999; Weiss 2004, 1998). The idea of using a "conceptual framework or program theory grounded in relevant substantive knowledge" gained popularity in the 1990s and represented a transition away from the previous more a-theoretical, methods-driven approach (Donaldson 2007:6). The program theory-driven evaluation science approach advocates examining program/intervention theory from three perspectives (echoing the effort to understand culture):

- the espoused program/intervention theory;
- the real logic of the program/intervention; and
- the optimal program/intervention theory.

This approach postulates a close relationship between the design of the intervention program and the design of the evaluation. As highlighted in the CDC webinar (Chapel 2008 available at [http://www.cdc.gov/asthma/program\\_eval/webinar1.htm](http://www.cdc.gov/asthma/program_eval/webinar1.htm)), both require agreement about the problem or goal to be addressed and agreement about:

- identification of the key target groups (both those who need to take action to support or implement the intervention/ and those who are subject to intervention activities);
- specification of the outcomes the intervention is designed to achieve, clarification of the mechanisms by which the proposed interventions are expected to create the desired outcomes, and the activities that address the problem or goal;
- description of the activities the intervention program needs to undertake;

- articulation of the program logic or program theory and underlying assumptions; and
- the starting conditions and context.

## 6.2.2 Design and Describe the Proposed Intervention Program

### Detailed Understanding of the Problems to Be Solved or Goals to be Achieved

The program-theory driven approach focuses first on ensuring that the problems to be solved or goals to be achieved are clearly understood in detail and agreed upon by the key stakeholders. When a safety culture assessment reveals weaknesses in or raises questions about the organization’s safety culture, it is likely that the licensee will need to conduct a follow-up investigation to further clarify the source, nature, and locus of the problems, gain some insight into why they have occurred, and clarify the nature of the problem to be addressed. This follow-up assessment needs to go beyond the surface manifestations of culture (attitudes, artifacts, and espoused values) to ensure that problems arising from underlying assumptions, established practices, or ways of thinking are identified and understood. It also needs to clarify how these problems are adversely affecting the organization and what the desired goals are. The approach calls for stakeholders of the intervention and assessment to be identified and included in the problem clarification/goal setting process (i.e., the follow-up assessment process).<sup>58</sup>

“Begin with the end in mind” (Covey 1989:95).

One suggestion for developing a clearer idea of the nature and reason for an identified weakness in a safety culture trait is to develop an analytical table similar to that shown in Table 6.1. The table lists the behaviors that demonstrate a safety culture trait being analyzed (in terms of what one does do and what one does not do), the beliefs needed to support those behaviors (in terms of self, work environment, other people), and the skills needed to perform those behaviors. This can provide a basis for determining whether the problem is with misunderstanding of behavioral rules, beliefs that are inconsistent with the desired behaviors, or lack of skills.

**Table 6.1** Framework for Identifying the Source of Weakness In a Culture Trait

Safety Culture Trait	Behaviors that Demonstrate Trait		Beliefs Needed to Support Behaviors			Skills Needed to Perform Behaviors
	What one Does	What one Does NOT Do	Self	Work Environment	Other People	
Questioning Attitude						
Personal Accountability						
Etc.						

<sup>58</sup> A key question is how accurate and detailed an understanding of the problem to be solved, gap to be closed, or goal to be achieved will result from the safety assessment, as designed.

## Clear Articulation of the Program Theory and Development of a Theory of Change and Program Logic Model

Once the problems are understood in detail, interventions to correct them can be developed. The program-theory driven approach calls for clear articulation of the *mechanisms* by which the intervention is assumed to accomplish its impact and careful consideration of how moderators of the problems and/or the intervention may affect the results and therefore influence the design of the implementation program. The problems to be solved, the purpose of the intervention, and how the intervention is presumed to solve the problems constitute the program theory. Social science theory, prior research, and knowledge of the problems and the individuals and organizations affected by the proposed intervention inform the program theory.

An important feature of this approach is the separation of the intervention program's implementation *process* and its *impact theory or theory of change*. The program process theory articulates the program's assumptions about *how* and with what resources it will:

- identify and reach its target population;
- interact with the target population (service utilization plan); and
- deploy program resources (organizational plan).

The program impact theory or theory of change describes the assumed cause-and-effect sequences that link and translate the programs activities, services, and resources into initial, intermediate, and long-term outcomes (i.e., the change theory). It focuses on clarifying how (with an underlying need to be able to explain "why") the proposed interventions will yield the desired change outcomes. Fishbein et al. (2001) and Fishbein and Cappella (2006) describe the role of theory in developing effective interventions, in part by providing a basis for predicting and understanding how the intervention would work for different subgroups.

Chen (2005:79) points out that articulation of the program theory serves both prescriptive and descriptive functions and that it may be important to use both forward (causal) reasoning ("if we did this, what consequence would result") and backward reasoning ("what are the ways we could have reached this outcome"). Elmore (1979) provides a description of backward mapping. Chen (2005:39) also highlights the possibility that an intervention program is based on one or a combination of scientific change theories. In these cases, the scientific theory provides both a framework for selecting previously developed intervention strategies and/or guidance for tailoring or developing and combining new ones. Alternatively, scientific change theories can be used to assess whether proposed intervention strategies are likely to be appropriate and/or adequate to achieve their intended outcomes and impacts. Logic modeling and analysis (discussed below) can provide a useful framework for such assessment.

All these authors acknowledge that a large proportion of intervention programs jeopardize their potential effectiveness by utilizing intervention strategies selected on the basis of the interests or capabilities of the implementer/sponsor or because they are familiar and seem reasonable. An exception seems to be the public health arena, where there appears to be a much closer relationship and integration between social science researchers and service/intervention providers (see, for example, Glanz et al. 2008).

One approach to articulating the program theory/theory of change and developing a description of the program that can serve as a basis for the design of its evaluation is logic modeling (Chen 2005; Donaldson 2007; Green 2005). Logic modeling is a process that helps those designing

the intervention lay out the components of the intervention and check the logic of their plan, in terms of the match between resources/schedules and proposed activities and between proposed activities and desired change. Experience has shown that the process of constructing a logic model is informative in itself, and that the completed logic model can provide an efficient basis for a first-order assessment of the match between the proposed intervention and the problems or goals to be addressed.

In the case of safety culture, requiring a Licensee to prepare, present, and explain the logic model of a proposed intervention and supporting descriptions of the intervention program could inform NRC's assessment of the planned corrective actions. At the very least this process would reveal whether the proposed intervention included actions targeting all of the weaknesses identified in the safety culture assessment.

The core elements of a logic model (W.K. Kellogg Foundation 2004; Chapel 2008) are specification of:

- the overall goal(s) - the organizational changes or impacts expected to result from program activities;
- the long-term outcomes (third-order outcomes)<sup>59</sup> - the specific changes that are expected or postulated to occur in the long term (i.e., the aggregate effects of the intervention);
- the medium-term outcomes (second-order outcomes) - the specific changes that are expected or postulated to occur in the medium term (i.e., effects that follow-on from the short-term outcomes);
- the short-term outcomes (first-order outcomes) - the specific changes that are expected or postulated to occur as a relatively direct result of the intervention activities and outputs;
- the intervention outputs - the direct results of program activities, usually described in terms of the size and/or scope of the services and products delivered or produced by the program, including indication of whether they were delivered to the intended audiences at the intended "dose";<sup>60</sup>
- the intervention activities - the processes, techniques, tools, events, technology, and actions of the planned program;
- the resources for or inputs to the intervention - the funding, personnel, equipment, supplies, staff time allocated to plan and implement the intervention; and
- contextual conditions - the factors that enable and enhance program effectiveness or limit and constitute barriers, such as lack of resources, competing intervention programs, etc.

The W.K. Kellogg Foundation Guide (2004) describes three types of logic models that are in common use:

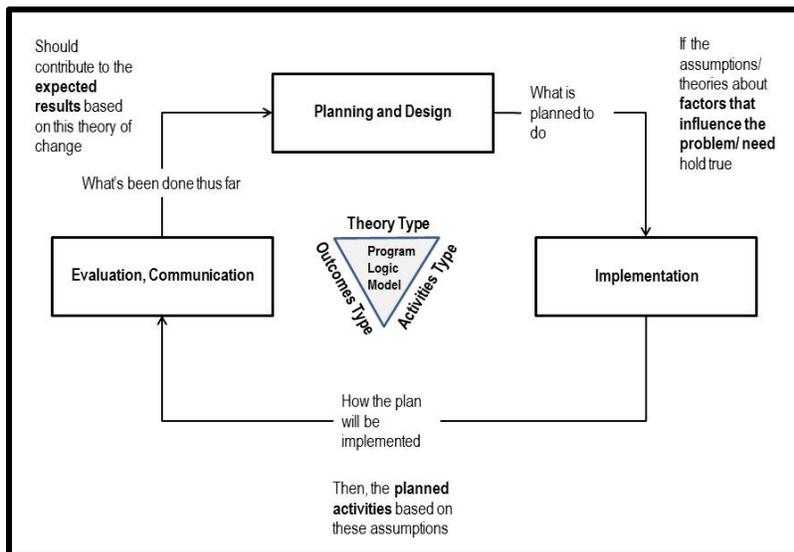
- theory approach;
- activities approach; and
- outcomes approach.

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<sup>59</sup> Outcomes are typically changes in variables such as attitudes, behaviors, knowledge, skills, status, level of functioning, relationships, etc.

<sup>60</sup> An example of a program output might be numbers of classes taught, meetings held, or materials produced and distributed; program participation rates; etc. (W.K. Kellogg Foundation 2004:8)

The Guide emphasizes the importance of using the type of model that best suits the program, which may be a composite model that combines elements of the three types. **Theory type** models emphasize the theory of change that informs the design of the program. This is the type recommended for safety culture interventions because it focuses on articulation of the program rationale and the relationship between the elements of the program and the need or problem on the one hand and the transition to the desired goal or status on the other. **Activities type** models focus on the specifics of the implementation process, both in terms of the components of the intervention program (resources to be applied, activities to be conducted) and its implementation, with the goal of providing a clear roadmap for planning, monitoring, and managing the implementation of the program. **Outcomes type** models focus on articulating an overall strategy for applying resources and activities toward a workable program or system of programs. This type of model is typically applied to large, systemic problems that require coordinated effort by multiple entities over a number of years. Although the outcomes type of model is based on a theory of change, the specifics of the change process are typically not emphasized in the model. Figure 6.2 illustrates these three logic model types and highlights their orientation and focus.



Source: Adapted from W.K. Kellogg 2004:9

**Figure 6.2.** The Three Types of Logic Models

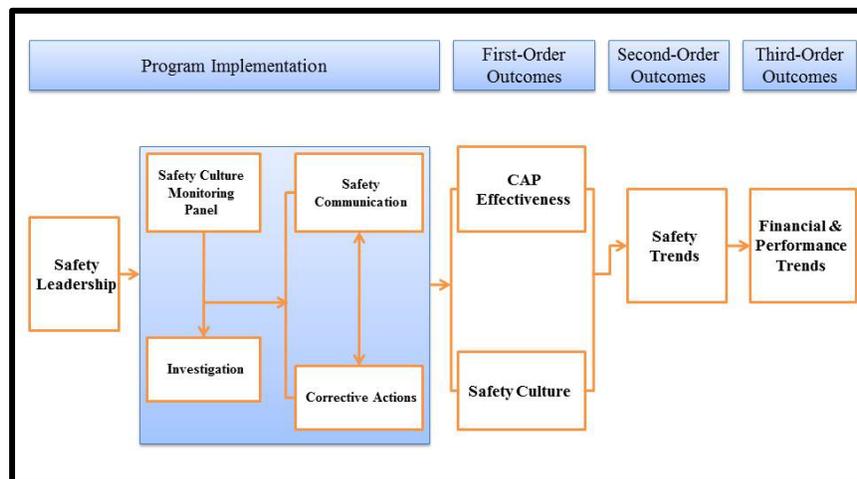
As noted by Chapel (2008) and Elmore (1979, 1983), it is sometimes easier to identify intervention requirements and strategies by working backward from the desired goals and outcomes (called backward mapping or reverse logic), asking “how to” obtain each particular outcome. This is why the element of the logic model are presented in this reverse sequence. In this process, Chapel (2008) also emphasizes the value of clarifying which activities and outcomes are under the control of the intervention program, and which the program can only influence. Many practitioners recommend alternating between backward and forward mapping, asking first “how could this desired outcome be achieved?” and then checking the proposed actions, outputs, and intermediate outcomes by asking “given this, then what would happen?”

As the pieces of the logic model are developed, the next step in logic modeling is to establish the sequence in which they would or need to occur. This requires examining the logic of the relationships among the pieces and, where possible, clarifying the mechanisms by which interactions between them would occur. The objective is to develop a model in which the resources/inputs are linked to activities, which are linked to outputs, which are linked through the near- and intermediate- term outcomes to the long-term outcomes by causal arrows. Clarifying this causal sequence provides another test of the logic of the proposed program. It also provides information needed to develop implementation, monitoring, and evaluation plans. When undertaken to address identified shortcomings or weakness in safety culture, the logic model needs to be informed not only by the attributes of the desired outcome (a strong safety culture), but also by what is known about the processes of individual, group, organizational, and cultural change and the management of change in organizations.

When done thoughtfully, preparing and annotating a logic model leads those designing an intervention to clarify their thinking, examine their assumptions, frames, and conceptual models, consider available resources, and articulate a rationale for the program’s design. The resulting logic model, especially when accompanied with sufficiently detailed annotations, provides a basis for those evaluating the quality and appropriateness of the proposed intervention program prior to its implementation to:

- examine the strength of the logic and program theory;
- assess whether the proposed activities address all the problems or weaknesses identified in the needs assessment (safety culture assessment);
- consider the adequacy of the proposed resources and the feasibility of the schedule;
- check that the program is tailored to the particular organizational context; and
- confirm that the monitoring and evaluation plan will collect appropriate and valid data.

Figures 6.3 and 6.4 illustrate the flexibility of logic models in terms of level of detail and accompanying explanatory information.



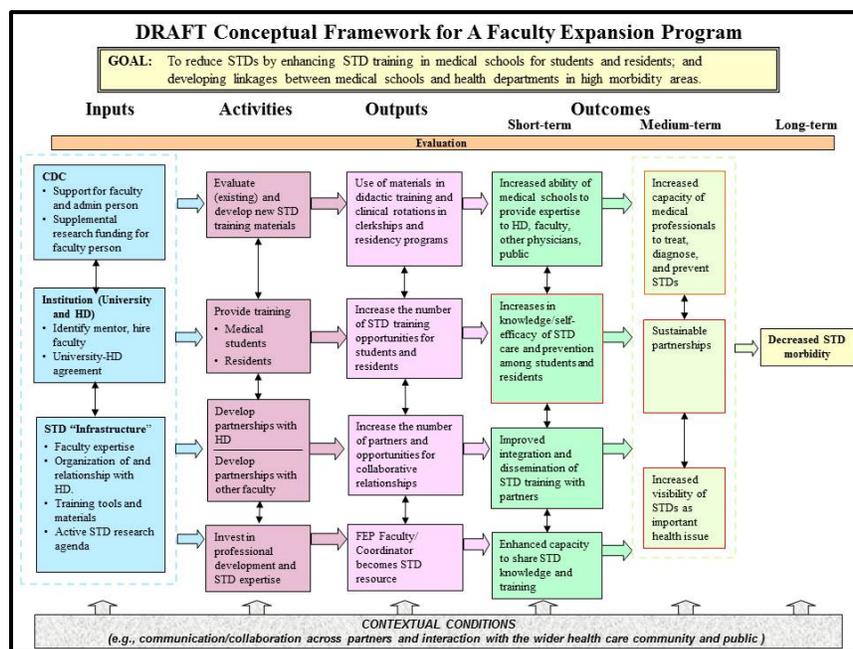
**Figure 6.3.** Logic Diagram of a Safety Culture Improvement Program

As shown in these figures, logic models can be specified at different levels of detail. A “drill down” approach is sometimes used to provide increased detail about components of the

program. The drill down can developed for the entire program or for those components where greater specification of the change mechanisms is needed to create a clear description of the program and the rationale of the proposed intervention.

As the intervention proceeds, this approach also calls for monitoring the implementation process against that specified in the program design/protocol. This “process evaluation” is important to document how closely the program’s implementation matched the program plan, identify unanticipated barriers that may require revision of the program logic, and provide a stronger basis for assessing the effectiveness of the intervention activities and change mechanisms.

A particular advantage of this approach is that it promotes transparency in terms of the outcomes to be achieved (for example, this would clarify whether the intervention was intended to change the organization’s safety culture, individuals’ safety behavior, and/or



Source: Battelle Center for Public Health Research and Evaluation 2004

**Figure 6.4.** Example Logic Model for Interventions to Reduce Sexually Transmitted Diseases (STDs) through a Faculty Expansion Program (FEP)

organizational safety performance, and what relationships were assumed to exist among them). Brousselle and Champagne (2011) present a modified version of logic modeling designed to enhance the ability to assess the plausibility of the program’s theory, drawing upon scientific knowledge of the cause-and-effect relationships implied in the intervention theory.

### Involvement of Stakeholders

The approach recommended by Donaldson (2007:10), Patton (2008), the CDC, and the W.K. Kellogg Foundation calls upon those involved in designing and implementing an intervention and its evaluation to work closely with stakeholders throughout the program and evaluation design and implementation process. Stakeholders are individuals or organizations who will be affected by the intervention program or whose support is needed for its success. The purpose of

this engagement is to develop more useful and effective intervention programs and evaluation information that addresses the questions most important to answer about the program. It also serves to develop a common understanding of the program theory and provides information useful in assessing the feasibility, under “real-world” implementation conditions, of the postulated relationship between the intervention and its target outcomes (initial, intermediate, and long-term). It also provides a vital pathway for identifying cultural attributes, particularly those at the level of assumptions, and other contextual factors that could facilitate or hinder the program. In addition, effective and respectful engagement of stakeholders is essential in creating an environment of trust and open communication. Finally consultation with stakeholders about how they interpret proposed change initiatives, and ensuring that this interpretation validates the proposed logic of the intervention, provides a valuable check on the intervention design and the degree of shared understanding between intervention leaders and recipients.

### **Leadership Commitment to Implementation**

Leadership’s demonstrated commitment is essential to the success of the change effort. It is one of the most determinative variables in organizational change initiatives. The commitment needs to be visible, ongoing, and genuine. Lack of clear and convincing leadership commitment to the change will result in heightened worker resistance, reduced engagement, and lowered motivation to implement the designed changes.

### **Monitoring, Evaluation, and Follow-up**

One of the ways that leadership exhibits commitment to the success of the intervention is by conducting visible and timely monitoring and evaluation. Monitoring and evaluation provide the triple benefits of reinforcing the change, modeling the characteristics of a learning organization, and providing information that tracks progress and enables timely mid-course corrections. Following up on the monitoring and evaluation information by communicating the results to the workers, discussing how the information is being used to make corrections and to fine-tune the program, reporting on progress toward the change goals, and seeking worker feedback reinforces these benefits and increases worker confidence that the organization is committed to accomplishing the change agenda. In addition, it demonstrates that the organization is “living” its espoused values of continuous learning and a questioning attitude. Consequently, the intervention plan should include a clear description of the monitoring, evaluation, and follow-up activities, including specification of responsibilities, timing, and method. Follow-up activities should extend long enough to confirm that the changes are providing sustainable improvements (DuPont and MTA Metro-North Railroad 2007; Fitzgerald 2005).

## **6.2.3 Issues Specific to Safety Culture Interventions**

### **The Conceptual Model of Safety Culture: A Holistic Concept or a Collection of Individual Attributes or Traits**

As pointed out by Reiman (2007) many definitions of organizational and safety culture reflect a mechanistic/functionalistic view of culture, and address elements/attributes as if they were individual, separable and specific features. These concepts about the nature of culture have a major effect on how “culture change” and interventions to intentionally change culture are viewed. In the holistic framework in which culture is emergent and constantly changing due to its own internal dynamic interactions, the idea that an “intentional, targeted cultural change” can be achieved through a specific intervention is incongruous. It is not if the organization’s culture is seen as a collection of individual attributes, which each may be changed as a consequence of a

targeted intervention. In addition to, or perhaps as part of the lack of consensus about definitions and a consistent framework for representing and talking about culture and particular attributes of a culture, it is difficult to maintain clarity about how culture change in organizations is conceptualized. Particularly inconsistent and confusing is the relationship between change in an attribute of the organization and a change in the culture of which that attribute is a part. This is particularly manifest in discussions about the role of behaviors by members of the organization relative to the culture of the organization. Schein (2010) and others emphasize the need to take into account that the safety culture of an organization is reflexive and dynamic, influenced by and influencing attributes of the broader societal context, the organization, the jobs, and the individuals.

### **Complex, Regulated Change Management Process in Systems with Interrelated Systems and Strata**

Wahlström (2011:66) notes the constraints and challenges of implementing change in the nuclear industry:

The management of change at nuclear power plants goes through strictly controlled procedures, which are enforced by the regulator. Special administrative instructions are written and used to control this process. At nuclear power plants a separation is usually made between technical modifications and organisational changes. The formal procedures for the management of change are sometimes perceived as preventing even well motivated changes, but experience has clearly demonstrated the need for thorough reviews of all modifications and changes before they are introduced (OECD/NEA, 2005).

The design of the intervention program needs to reflect this reality, and be clear about how proposed changes will be undertaken within this system (Mylett 2010). Impacts on scope, timing, and personnel requirements need to be identified and reflected in the implementation and follow-up plans.

### **Validity and Adequacy of the Safety Culture Assessment and its Analysis as a Needs Assessment for Intervention**

As part of its evaluation of a proposed intervention/corrective action, the NRC reviews the safety culture assessment itself to validate that the assessment and any follow-up analysis provide a valid and adequate basis for the design of an intervention. This could include the following elements:

- Validate that the assessment information collection methods were appropriate and were implemented correctly.
- Validate that pertinent stakeholders were engaged.
- Validate that the data were analyzed correctly.
- Determine whether the assessment identified the root causes of problems and weaknesses.
- Determine whether the assessment identified strengths that could be used to help overcome the identified problems and weaknesses.
- Determine whether the process is integrated with consideration of the overall safety management system (SMS).
- Determine whether the issues identified reflect problems and weaknesses in the safety culture or problems and weaknesses in the organization's broader safety management system.

## **Defining the Target of Intervention and the Outcome of Interest: Safety Culture Traits, Safety Behaviors, and/or Safety Performance**

Behaviors and behavior change are central areas of focus in the literature on safety management, safety culture, organizational, and individual change. Hofstede (1998, 1991), Reason (1997), and Hopkins (2002) are among those who advocate focusing on collective practices, or behaviors, with regard to safety culture, in part because collective practices are more directly amenable to influence by factors that are under the control of management (e.g., structures and systems). However, as DeJoy (2005) points out, some studies dealing with safety culture posit that safety culture is a mediating variable that influences safety behaviors and behavior change, which are the outcome variables of interest and concern (Wirth and Sigurdsson 2008; Krause 2004; Krause et al. 1999; Fitzgerald 2005)<sup>61</sup>. Indeed, a number of studies have been undertaken to examine the relationship between safety climate/culture and safety behavior (see for example Baram and Schoebel 2007; Cooper and Phillips 2004; Geller 2000; Morrow et al 2010; Mullen 2004; Neal 2006; Neal and Griffin 2002; Pousette et al. 2008; Tharaldsen and Haukelid 2009; Wills et al. 2006; Zhou et al. 2008; and Zohar 2003). Others view safety culture and change in safety culture as the outcome variable of interest, with change in safety behaviors either considered a driver or attribute of culture change (Human Engineering 2005a,b). Given this potential ambiguity about the relative roles of safety culture and behaviors as outcome measures and/or targets of interventions, this is an area for the NRC to pay close attention to in both the assessment process and certainly in the intervention/corrective action plans.

## **Monitoring for Unintended Adverse Consequences**

Because organizations are complex systems, interventions have the potential for unintended adverse consequences. Consequently, it is important that those conducting and evaluating the intervention efforts are alert to the potential for such adverse consequences and have systems in place to identify and address them. Armenakis and Bedeian (1999) point out that a number of studies have found that organizational change initiatives often have mixed outcomes, achieving some of the intended changes in performance while simultaneously causing unintended negative changes in worker's commitment to the organization, morale, cynicism, and job satisfaction. Reiman et al. (2008) highlight the importance of conducting organizational safety reviews following significant interventions to check for, and correct, unintended adverse consequences of the intervention on safety.

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<sup>61</sup> Often because of their demonstrated or posited relationship to organizational safety performance.

## 7 Implications and Conclusions

Some of the organizations subject to NRC regulation are well-established, hierarchical organizations, with many formal systems that to consider when designing and implementing interventions. The context of organizations that manage nuclear materials influences intervention strategies toward conservatism and incrementalism, which can make it difficult to establish the urgency needed to motivate and sustain change initiatives. As Wahlström (2011:71) points out, regulatory requirements often “enforce proven technologies and require thorough reviews of changes.” These contextual elements should be taken into account in both the design and evaluation of proposed interventions.

The documentation for the logic models and intervention plan should be designed to provide those evaluating the quality and appropriateness of the proposed intervention program with sufficient information to:

- examine the strength of the logic and program theory;
- assess whether the proposed activities address all the problems or weaknesses identified in the needs assessment (safety culture assessment);
- consider the adequacy of the proposed resources and the feasibility of the schedule;
- check that the program is tailored to the particular organizational context;
- confirm that the monitoring and evaluation plan will collect appropriate and valid data; and
- judge the overall adequacy and acceptability of the proposed intervention plan.

The logic models and intervention plans, in combination with the monitoring and evaluation data that are collected over the course of its implementation, provide a resource of information about the effectiveness of the intervention strategies that could be analyzed and used to inform subsequent safety culture assessment and corrective action efforts. Development of a template for this documentation, drawing upon the framework provided by the program theory-driven evaluation literature and logic modeling could clarify and standardize this process.

The documentation accompanying the logic models and intervention plan should demonstrate that each of the following elements have been, or will be, addressed thoroughly and appropriately.

### 7.1 Adequacy of the Safety Culture Assessment

An important first step is for the Licensee and the NRC to assure that the safety culture assessment that has identified the needs for improvements in the organization’s safety culture has been conducted in a proper manner and at sufficient depth to identify and characterize the deficiencies and to understand their root causes. This is likely to entail follow-up investigation to determine the root cause(s) of the problems and weaknesses revealed by the safety culture assessment and to determine:

- what the scope and nature of the problem is;
- where in the organization the problem is located;
  - ▲ throughout the organization
  - ▲ in particular groups or teams

- ▲ at particular hierarchical levels
- ▲ between particular groups or levels
- when the problem occurs;
- why the problem is occurring; and
- how knowledgeable people in the organization think the problem might be solved.

The assessment should ensure that the status of the fundamental cultural dynamics that characterize organizations, including trust, fairness, engagement, and communication are adequately described. It should identify indications of misalignment between the broader organizational culture and the desired safety culture and between the organizations structures and processes and desired safety culture. Problems identified in these areas will influence the nature of the intervention that is needed and the measures that will be feasible. To reveal this information, the information gathered in the assessment should be reviewed from a systems perspective. The concepts discussed in Chapters 2 and 3 can help inform this analysis.

Before proceeding, it would be valuable to confirm that the organization's interpretation of the meaning of the assessment results and the severity and priority of the problems and weaknesses identified is consistent with the NRC's interpretation. This includes confirming that there is a common and informed understanding about the relationship between the organization's structures and processes, the broader organizational culture, and the organization's safety culture and the potential scope of the intervention effort.

## **7.2 Identification of Barriers to Change and Facilitators of Change**

In addition to identifying issues associated with the central attributes of trust, fairness, accountability, and respect, the assessment should also include a critical evaluation of the leadership at all levels to determine whether leaders are sufficiently informed, involved, committed, empowered, and resourced to provide the leadership necessary to implement the corrective actions effectively and to sustain the changes once they are achieved. The assessment should also highlight any other barriers to change that should be addressed in the design of the intervention program, for example lack of skills, dysfunctional systems, countervailing norms, competing priorities, etc.

At the same time, the assessment should also be identifying strengths and resources in the organization that can be used to advantage in the intervention process. Well-established practices and cultural traits that facilitate change should not be overlooked. For example, as Wahlström (2011) points out, the industry has a long tradition of sharing knowledge that is supported by both culture and formalized systems. It also has a well-established system for performing audits and performance reviews.

The integrated behavioral model discussed in Chapter 4 can provide a systematic guide for the identification of elements that could be barriers to or facilitators of change in the organization or for a particular group.

## **7.3 Clear Model of Required Changes**

Simple identification of the traits that appear inadequate is unlikely to provide the information needed to develop a robust model of what changes are required to strengthen the organization's safety culture. The various individual and organizational change models

discussed in Chapter 4 can be used to help clarify assumptions and identify alternative approaches. The Integrated Behavioral Model in Chapter 4 (along with others that address applicable elements) and the diagnostic table of traits, behaviors, beliefs, and skills from Chapter 6 could be used to help specify the nature of the weaknesses or problems and the changes needed. Information from the literature discussed in Chapter 5 and Appendix A can inform evaluation of types of interventions and combinations of measures proposed to accomplish that change.

#### **7.4 Realistic and Informed Approach to Behavioral Change**

The proposed intervention plan should provide sufficient information for the NRC to evaluate its soundness in terms of targets, methods, resources and level of effort, time line, and communication and engagement activities. It should include a rationale explaining the basis for its target audience and intervention methods, which should reflect the very well documented factors that influence behavioral change in individuals. The NRC can draw on the theories and tools reviewed in Chapters 3 and 4 to evaluate whether the proposed intervention plan addresses all of the elements with a sufficient level of intensity and duration to motivate, enable, and sustain the desired behavioral change.

#### **7.5 Identification and Review of Previous Change Initiatives and Programs**

The nuclear industry has the benefit of a relatively well-documented and researched history of change initiatives and programs, many of which have targeted the organizational structures, processes, practices, and cultural attributes likely to need strengthening. The design and assessment of change interventions could be significantly informed by this past experience. Wahlström (2011), for example, describes an assessment of the “LearnSafe” project that was undertaken to strengthen learning within the nuclear industry during the period of rapid change following deregulation at the end of the 1990s. His assessment identifies facilitators and hindrances to the resolution of each of the issue types identified, and proposes a model for consideration in efforts to change an organization’s learning culture and practices. Additional information about the success of change initiatives and measures can be found in the literature on learning, quality, and sustainable organizations reviewed in Chapter 5 and in the guides to interventions specific to safety culture in Appendix A.

#### **7.6 Clear Intervention Design and Implementation Plan with Adequate Leadership and Resource Support**

The NRC could request that the intervention plan is accompanied by a logic model and supporting documentation that includes description of how stakeholders are being engaged. The NRC can use the backward mapping approaches described in Chapter 6 as part of its evaluation of the adequacy of the proposed intervention. It can also apply the theories and models in Chapter 4 to identified gaps and unmet needs. Each proposed intervention should be based on a clear model that links cultural traits to the behavioral mechanisms that impact safety outcomes. These models must be sufficiently rich to include mediating and moderating factors, and clear enough that the NRC can use them to evaluate how well they address the issues identified in the safety culture assessment. In addition, the NRC could request that site leadership publicly and specifically commits to the intervention goals and the change program.

## **7.7 Measurement and Monitoring to Verify that Corrections Have Been Made**

The implementation plan should include a clear description of the documentation and progress monitoring that will be conducted as the implementation initiative proceeds. This is another use of the logic modeling approach, which can help specify the planned implementation schedule. In addition to verifying that the planned intervention activities have taken place, those performing the intervention should also be monitoring progress toward the safety culture and behavioral goals. Such monitoring can be done at intervals throughout the intervention process, with a concluding assessment following completion of the implementation plan. The assessment should be designed to assure the collection of information that will demonstrate whether or not the problems have been corrected. The literature on theory-driven evaluations discussed in Chapter 6 can inform this process. Fitzgerald's (2005) description of experience with several intervention programs focused on improving safety culture emphasizes the importance of monitoring progress among individuals at different levels of the organizations and using the monitoring information to refocus or modify the intervention efforts.

## **7.8 Follow-up to Ensure that Corrections Are Embedded, the Problems Are Not Reoccurring, and No Unanticipated Adverse Effects Need Attention**

Cultural change is notoriously difficult to sustain. Consequently, it is important to monitor the status of the organization's safety culture closely for a period following the intervention to identify problem reoccurrence when it first emerges and to ensure that adverse unintended effects from the intervention effort are detected and addressed. Reoccurrence of problems may be an indicator that the root cause was not accurately identified or it may indicate deeper issues of alignment with the broader organizational culture.

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## **APPENDIX A**

### **Summary of Safety Culture Improvement Guides and Tailored Approaches**

## **APPENDIX A: Summary of Safety Culture Improvement Guides and Tailored Approaches**

### **A.1 Schein’s Organizational Culture Change Approach (2010)**

Schein (2010) presents a psycho-social stage model of intentional cultural change in organizations, and assumes that the cultural change is being led as a top-down effort that is managed by “leaders” and focused on individuals. He applies Kurt Lewin’s (1947) famous three-stage change model (unfreeze—replace/move—refreeze) model, elaborating on methods to accomplish each of these three stages. This reflects his emphasis on applying Lewin’s force field theory in which analysis of the organization’s culture focuses on identifying and comparing the relative power of aspects/drivers that support the change and aspects/drivers that oppose it. This is an approach that is also recommended in the program theory-driven evaluation science approach. In our view, Schein description of organizational culture and change does one of the best jobs of conveying the “cultural” dimensions in a way that conveys its embeddedness and complexity. His primary and secondary culture-embedding mechanisms are widely used in both the assessment of organizational culture and in culture change strategies.

### **A.2 Cooper’s Practical Guide to Improving Safety Culture (2001)**

Cooper (2001) provides a “practical guide” to improving safety culture, utilizing a standard top-down intervention project planning and implementation approach. He provides recommendations for each of three stages of safety culture development (immediate, intermediate, ultimate) that relate to the culture safety ladder of IAEA. He credits regulation (the EC goal-setting legislation that “places an onus on organizations to identify and properly manage the risks created by their activities) with providing the impetus for organizations to undertake this effort. He does not provide any empirical or theoretical basis for the components/approach recommended for each of these three stages. He presents “Cooper’s Reciprocal Safety Culture Model” that lists the person, organization and job attributes in the safety climate, safety management system, and behavior-based approach dimensions. A safety culture entails all three of these dimensions.

### **A.3 Human Engineering’s Safety Culture Inspection Toolkit (2005a; 2005b)**

The Safety Culture Inspection Toolkit developed for the U.K. HSE and the U.K. rail industry by Human Engineering (2005b) underscores the importance of making sure that safety culture assessment results are fed into a formal system for designing and implementing actions.

### **A.4 Step Change Safety Culture Improvement Process (2000)**

The Step Change process identifies a set of safety culture maturity elements and a five-level maturity stage model. For each maturity element, it proposes characteristics that demonstrate progression across the levels. For each level, it identifies behavior modification programs. The maturity elements include:

- communication;
- learning organization;
- production vs safety emphasis/priority;
- demonstrating management commitment;

- health and safety resources;
- participation in safety;
- shared perceptions about safety;
- trust within the organization;
- industrial relations and job satisfaction; and
- training.

The behavior modification programs, which would be applied at different levels of safety culture maturation include:

- knowledge-based safety leadership;
- training interventions;
- leadership skills;
- management initiated programs;
- upward feedback;
- employee-managed programs;
- team led development; and
- leading indicator led programs.

### **A.5 U.S. DOT-JPDO Safety Culture Improvement Resource Guide (2008)**

The Joint Planning and Development Office Safety Group’s Safety Culture Improvement Resource Guide is focused on establishing and improving safety culture in the aviation industry. The Safety Group assembled information from industry stakeholders and government organizations. In the framework represented in this guide, a strong safety culture is seen to provide the “foundation for building a successful Safety Management System (SMS).” This implies that a strong safety culture is considered a precursor to establishment of an effective SMS, rather than the other way around. The key components of a healthy safety culture identified in this guide are:

- reporting culture;
- just culture;
- flexible culture;
- learning culture; and
- informed culture.

The guide identifies four tools to improve safety culture, and recommends ongoing monitoring and assessment both to measure progress and reinforce commitment:

- training;
- use of Ombudsman;
- inclusion of Safety in annual performance assessment; and
- rewards and recognition for safety.

There is no discussion of the assumptions, theories, or rationale behind these recommendations or framework.

## **A.6 Dupont/MTA Metro-North Railroad Flyer on Safety Culture Change (2007)**

This brief description of a collaboration between DuPont and MTA Metro-North Railroad reported on an initiative to establish a safety system that would “change the basic safety culture, enable continuous improvement, and substantially reduce injuries.” The theory of action was that an approach to safety that had people in contact with people would change the culture of safety. DuPont claims to have enhanced the existing safety program and implemented new safety methods and strategies. This multi-year management driven initiative implemented a complete safety management program focused on safety behavior change by focusing on “several key elements of culture change.” The changes specified include improving and enhancing processes, building skills and understanding by:

- fostering line management support (seen as critical for sustainability) by helping them incorporate safety processes into their everyday jobs, learn critical safety leadership skills, and promote change in their employees through an increasing frequency of proactive interactions;
- building safety into how work is performed by enhancing safety processes of each work group, challenging work groups to identify 15 key safety behaviors that would make their jobs safer, conducting job safety analyses, and implementing mandatory controls to avoid identified hazards; and
- teaching the organization to receive and act on feedback from a safety auditing process for supervision so that the safety observations facilitate meaningful safety discussions.

## **A.7 Hale et al. Evaluating Safety Management and Culture Interventions to Improve Effective Intervention Strategies (2010a, 2008)**

This study reports the result of a systematic evaluation of the effectiveness of interventions introduced to change the safety culture and safety management systems and thereby reduce accidents. A before-after study of 17 projects in 29 companies documented the state of the company’s safety management and risk control efforts and accident rates. It is perhaps the most directly applicable to the identification and assessment of safety-related interventions. However, the *objective* of the interventions was to reduce accidents, not to enhance safety culture, though many of the interventions could be considered efforts to do that (i.e., safety culture was treated as a mediating factor). Most organizations in the study implemented a range of changes, often including those targeted on both work processes and safety culture, directed at individuals in many different positions within the organization (ranging from directors to new and temporary workers). The study does identify candidate interventions, though their intended relationship to impact on safety culture (as opposed to some other aspect of the organization) is not entirely clear. They report that interventions were chosen primarily based on a review of the organization’s existing safety management system and were often framed as a way to fill identified gaps in the system.

Hale et al. (2010a:1027) view risk control and safety management as a hierarchy of system levels, with work processes controlled by a combination of technology and human behavior. In this view, technology and human behavior are controlled, or at least influenced, by management’s provision of resources, information, and instruction. Hale et al. identify workers’ motivation to choose the safe course of action as an important component of resources and controls.

### **A.8 Zhou et al's Method to Identify Strategies for Improving Human Safety Behavior by Considering Safety Climate and Personal Experience (2008)**

This report applies a Bayesian network-based model to estimate the influence of safety climate factors and aspects of personal experience on safety behavior. This is similar to an analysis by Gustafson et al. (2003) who used a Bayesian model and expert panels to estimate the likelihood of successful organizational change (not focused on safety culture or safety performance). This model was examining the premise that an organizational change that increased attributes of safety culture/climate would affect worker's safety behavior. It did not examine how such change in safety culture/climate would be accomplished.

### **A.9 Fitzgerald's Safety Performance Improvement Through Culture Change (2005)**

This discussion of the U.K. HSE efforts to transition successfully through three phases of safety performance change: 1) accidents go with the job; 2) dramatic improvement; and 3) roller-coaster phase. It emphasizes the role of a safety culture in achieving greater commitment, involvement, and ownership of safety by an organization's employees. Fitzgerald (2005:325) emphasizes that safety culture assessment data can indicate safety culture problems, but that "the particular cultural shortfall cannot be identified from the overview data...." He argues that safety culture improvement is a component of a culture of continuous improvement: "There is nothing that makes safety improvement different from any other aspect of business performance improvement, but safety has to be seen as an achievable business requirement as much as the manufacture of profitable components or tonnes of product – and this is the real cultural challenge" (p. 325). The HSE approach emphasizes the engagement and participation of workers.

### **A.10 Efforts to Implement/Improve Patient Safety in Medical Systems**

There is a rapidly growing literature on efforts to improve patient safety and establish/enhance a safety culture in medical providing systems. Nurses and nursing organizations are particularly active in this effort and are the source of many articles. This literature illustrates the issue raised in the workshops on NRC safety culture policy by those in the medical sector concerning the conflict between decision/culture priorities, given the medical profession's deep commitment to putting patient well-being above all others. This literature provides a good illustration of how these different mental models and organizational/professional cultures lead to differences from, for example, the nuclear power industry organizations. For a discussion of these efforts, see Ranji et al. (2008); Blegen et al. (2010); Dennison (2005); The Emory Center (2004); Jaén (2010); McCarthy and Blumenthal (2006); Wischet (2009); and Yang et al. (2010). We anticipate that the literature on safety culture in the medical arena will grow rapidly. This literature identifies the following preparatory mechanisms for organizations undertaking to build a safety culture:

- establishing safety as a core value;
- creating behavior-based expectations for error prevention tailored to different positions;
- developing root- and common-cause analysis and failure mode and effects analysis programs that involve team members;
- developing a questioning attitude; and
- focusing and simplifying work processes and procedural documentation.

Factors identified as important in building and sustaining a safety culture in health care organizations include:

- commitment of senior management/leadership;
- recognizing that humans are fallible and that errors will occur;
- patient-centeredness;
- non-punitive reporting of errors and near misses;
- collaboration among team members to develop safeguards for error prevention; teamwork, communication, and collaboration;
- rewards and recognition to incentivize and motivate desired behaviors;
- human resources policies and procedures; adequate staffing, including administrative support;
- prioritization of operational goals to ensure that time and resources made the safety initiative the key focus;
- involvement and participation of stakeholders (patients, managers, employees, and medical staff throughout the process);
- site-based safety initiative teams of operational leaders with responsibility for leading the safety initiative implementation and ensuring effective communication across the organization;
- using technology and equipment that supports patient safety;
- information accessibility;
- topic-specific education regarding safety;
- willingness to learn and try successful techniques from HROs outside health care; and
- adherence to established policy and procedures.



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