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# Trust, Safety, and Employee Decision-Making: A Review of Research and Discussion of Future Directions

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# Trust, Safety, and Employee Decision-Making: A Review of Research and Discussion of Future Directions

*By Dr. Gretchen A. Mosher*

## ABSTRACT

Managing workplace safety in the technology work environment has traditionally focused on factors such as physical design, machinery operations and other hardware counter-measures. Cognitive-based human factors have not seen a strong emphasis by safety and technology researchers. This is beginning to change as investigators have begun to examine how the management of human factors could impact safety in the workplace. One of these factors is trust.

A second factor, safety climate, measures the perception employees have of the relative importance of safety within an organization. Although limited research has examined the association between trust and safety climate, little empirical data has been collected on the relationship between the two concepts as they relate to the decision-making process of employees. Trust has been shown to have a positive effect on workplace safety climate, which in turn has been hypothesized to play a role in employee decision-making. Yet, research measuring the relationship between trust, safety, and employee decision-making has been limited.

This analysis will outline the concept of trust and its relationship to safety climate and safety-related decision making. Definitions of trust, past safety climate research, and relevant decision-making theories will be highlighted. The challenges of existing measures of trust, safety climate, and decision-making will be discussed. New directions for research in safety decision-making will conclude the paper.

## INTRODUCTION

Several factors are hypothesized to influence employee perceptions of safety within an organization and the decisions they make as a result of their perceptions. One of these factors is trust, which has been shown to play a positive role in several workplace outcomes including employee cooperation, problem solving, and high quality communication (Dirks & Ferrin, 2002; Kramer, 2006). The concept of trust has been examined from researchers in a variety of disciplines. Researchers have debated the indicators, meaning, and conditions of the deceptively complex topic of trust. Exploration in disciplines such as psychology, business, management, leadership, and safety has also made impor-

tant contributions to the understanding of trust in the workplace.

The role of safety in the workplace has also been an important consideration for supervisors and managers. Professional leaders in the field of technology consider the subject of safety important enough to include it on the certification exam administered by the Association of Technology, Management, and Applied Engineering organization (Freeman et al., 2009). In addition, Miller, Heidari and Marsh (2004) found industrial safety to be the only content area which received 100 percent support from technology department chairs when they were surveyed on content areas to be included on the certification exam.

Because of the influence trust has on safety climate in the workplace and the importance of safety climate to the field of technology, the topic of trust and safety climate warrants further investigation. In addition, the success of workplace safety programs is dependent on the decisions employees make on the job (Zohar & Erev, 2007). An increased understanding of factors influencing the employee decision-making processes is an important component of occupational safety and could potentially provide the basis for associated employee educational intervention.

## A LITERATURE REVIEW: DEFINING TRUST

Most theoretical definitions of trust acknowledge two parts: 1) a willingness to be vulnerable to another party to perform expected and desirable actions even though the party cannot be managed or scrutinized and 2) the implication that this vulnerability leads to a certain degree of risk or dependency on the other party to act in a benevolent manner (Dirks & Ferrin, 2002; Kramer, 1999; Mayer, Davis, & Schoorman, 1995; Shockley-Zalabak, Ellis, & Wingrad, 2000; Slovic, 1993; Whitener, Brodt, Korsgaard, & Werner, 1998). The model of trust suggested by Mayer et al. (1995) includes two other important components: a trustor and trustee. The trustor is taking a risk that allows his or her fate to be determined by another party (Currall & Epstein, 2003) and is therefore, the more vulnerable of the two parties. The second party, the trustee, is the party who is to be trusted. Mayer et al. (1995) suggest that although the vulnerability is lower

for the trustee, he or she must work to overcome pre-determined perceptions regarding the trustee's motives and intentions held by the trustor.

Vulnerability, risk, and the existence of two parties play an important role in defining trust. Vulnerability is central to the definition because trusting relationships must have meaningful incentives at risk, leading to the possibility of the trust being breached from the trustee's perspective (Davis, Schoorman, Mayer, & Tan, 2000). Without the uncertainty inherent to risk and vulnerability and the possibility of the second party not following through on promised actions, no trust would be necessary within relationships. The need for trust only becomes important when an uncertain situation occurs (Rousseau, Sitkin, Burt, & Cameter, 1998).

Although many researchers have offered definitions of trust, the meaning of trust is deceptively complex. To increase knowledge of the conditions forming the concept of trust, researchers have attempted to explain and test constructs of trust in various scenarios. Butler (1991) proposed ten conditions of trust and existing literature on the subject has used Butler's work as a starting point. Mayer et al. (1995) introduced a model which included only three antecedents, folding several of the Butler conditions into these three and also enveloping models proposed by Sitkin and Roth (1993). Kramer has also written extensively on organizational trust, editing three volumes on the topic (Kramer & Tyler, 1996; Kramer & Cook, 2004; Kramer, 2006). Table 1 outlines previous research on the trust and constructs defined by others.

Although researchers have not come to complete agreement on the constructs which explain trust, five constructs are frequently used to describe its meaning. These are: consistency, credibility, competence, concern, and communication. The constructs and researchers' interpretation of them are described below.

Consistency is identified by several researchers as a condition of trust (Butler, 1991; Clark & Payne, 1997; Levin, 1999; Whitener et al., 1998). Other researchers use alternate words to describe the same action, including reliability (Mishra, 1996; Shockley-Zalabak et al., 2000), past actions (Currall & Epstein, 2003) and predictability (Gabarro, 1978). Although predictability, reliability, and past actions may play a role in a trusting relationship, significant trust must surpass these. Depending on the resulting action, predictability, reliability and history of past actions can be a positive or negative characteristic (Mayer et al., 1995). For example, if a supervisor continually makes poor decisions, employees may be able to accurately forecast his or her decision, but still not trust him or her to make positive decisions concerning safety.

Given this, consistency does form a basis for trust because of its emphasis on reliable behavior and its significance in leader actions (Mishra, 1996). Dependable and consistent behavior is grounded in a correspondence between the actions and the words of management and supervisory personnel across both events and experiences over a period of time (Shockley-Zalabak et al., 2000). Consistent behavior and congruence between words and actions helps lower the vulnerability of the employee, increasing his or her trust levels, while inconsistencies between words and actions decrease trust levels in employees

**TABLE 1. CONDITIONS AND ANTECEDENTS OF ORGANIZATIONAL TRUST**

| | |
|---|---|
| Butler (1991) | Availability, competence, consistency, discreetness, fairness, integrity, loyalty, openness, promise fulfillment, and receptivity |
| Clark and Payne (1997) | Competence, consistency, fairness, integrity, loyalty, openness |
| Clark and Ward (2006) | Ability, integrity, fairness, openness |
| Cufaude (1999) | Openness, competence, promise fulfillment |
| Cummings and Bromiley (1996) | Reliability, consistency, avoids taking excessive advantage |
| Currall and Epstein (2003) | Benevolence, competency, commitment, past actions |
| Levin (1999) | Consistency, credibility |
| Mayer, Davis, Schoorman (1995); Mayer and Gavin (2005) | Ability, benevolence, integrity |
| Mishra (1996) | Competence, concern, openness, reliability |
| Shockley-Zalabak, Ellis, and Winograd (2000) | Competence, openness/honesty, concern, reliability, identification |
| Sitkin and Roth (1993) | Ability, value congruence |
| Whitener, Brodt, Korsgaard, and Werner (1998) | Consistency, integrity, communication, concern, sharing and delegation of control |

(Shockley-Zalabak et al., 2000; Levin, 1999).

A second common construct of trust which has been proposed by several researchers is credibility. Many words can be used to describe credibility (integrity, honesty, moral character, fairness, etc.), but from an employee perspective, high credibility is characterized by consistency between words and deeds (Whitener et al., 1998). Although credibility is similar to consistency, the construct goes beyond the expected alignment of the administrator's actions and words. Mayer et al. (1995) suggests that a key additional point is the role of the trustor as an important component of credibility perceptions and the importance of equivalence between the values of the trustor and the trustee. Without agreement on values, the actions of the trustee may be perceived as only consistent rather than credible.

Another construct of trust identified by several researchers is competence. Competence is characterized by a level of knowledge and skill and how these are employed by the organizational leadership to make decisions (Clark & Payne, 1997; Mishra, 1996). An expansion of the definitions by Davis et al. (2000) and Shockley-Zalabak et al. (2000) classify competence as a major component of the effectiveness of leadership and of the organization's potential survival in the marketplace. Mayer et al. (1995) add an important condition to the construct of competence – the limited amount of trust given to supervisors or management when they are outside of their area of expertise.

A fourth construct frequently identified when defining trust is concern or benevolence. Mayer et al. (1995) defines benevolence as the extent of concern the trustee has for the trustor. Mishra (1996) characterizes concern as the perception that one party will not take advantage of another when the other is vulnerable. Whitener et al. (1998) consolidates both definitions into three actions: 1. demonstrating thought and responsiveness to the needs and interests of employees, 2. protecting employee interests by sensitive actions, and 3. balancing personal interests against the interests of others. Shockley-Zalabak et al. (2000) and Edmondson (1996) describe concern as a culture which builds psychological safety by emphasizing their social capital. The sincerity of caring, empathy, and tolerance allows for an organization which treats mistakes as learning opportunities rather than as reason for punishment. Shockley-Zalabak et al. (2000) particularly emphasize the role of the sincerity in the above feelings for building organizational trust among employees.

The final significant construct defining the meaning of trust is perhaps the most important because without communication and openness, none of the other constructs would have the same significance. The construct of communication and openness includes actions such as the timely sharing of accurate and relevant information, explanations of decisions under consideration or already made, and an open, non-defensive, and sincere delivery of the information to all relevant parties (Cufaude, 1999; Levin, 1999; Mishra, 1996; Shockley-Zalabak et al., 2000; Whitener et al., 1998). Mishra (1996) suggests openness plays an especially key role in trust between managers and subordinates, but also cautions that extreme openness may actually decrease trust rather than increase trust levels.

### Definition of Trust: Conclusions

All of the constructs above are important to workplace safety. Even so, constructs listed above do not provide the full scope of all published definitions. Bringing together a universal definition for a value-laden word such as trust is challenging and the multiple similar and equivalent words describing the meaning of trust make the formation of a solitary operational definition even more difficult. The constructs reviewed above are not intended to replicate the constructs displayed in Table 1 nor are they intended to be seen as the best definition of trust for every environment. Instead, the list of constructs given above is presented because the words reflect, in the author's opinion, the most important concepts connecting trust and safety. Consistency, credibility, competence, concern, and communication all play an important role in creating a positive safety climate.

A positive safety climate is characterized by consistent and competent leaders who take the safety of their workers very seriously (Clark & Payne, 2006; Clark & Ward, 2006). Credibility of all parties is important in safety-sensitive work areas as well, with the credibility of employees, supervisors, and management all playing a role in the safety outcomes of a workplace. Finally, consistent and credible communication plays an essential role in workplace safety programs, letting employees know what the expectations are in terms of their safety behavior (Conchie & Burns, 2008; Edmondson, 1996).

Although the concept of trust may seem very straightforward, its complexity has challenged researchers for several decades, which has made its measurement difficult. Nonetheless, trust has been shown to predict safety perceptions in the workplace, therefore, it is a logical hypothesis that the influence of trust would extend to safety climate. The next section will discuss the relationship between trust and safety climate in greater depth.

## A LITERATURE REVIEW: TRUST AND SAFETY IN THE WORKPLACE

In the workplace, trust has several important implications for both workers and management (Willemyns et al., 2003). Davis and Landa (1999) found that 43% of workers believe their managers cheat or lie to them, and 68% do not trust their managers, but they did not investigate how this impacted

workplace safety. Conchie and Donald (2008) determined that trust-related properties played a substantial role in the development of a safe workplace. Other safety researchers have found that trust affects safety related outcomes both directly and indirectly (Burns, Mearns & McGeorge, 2006; Conchie & Burns, 2008; Cox et al., 2006).

Safety climate is a measurement tool used to provide organizations with a snapshot of employee perceptions on the priority of organizational safety compared to other organizational outcomes such as productivity or quality (Zohar, 2000). The important direct effect of safety climate on employee behavior has been demonstrated (Johnson, 2007; Keren et al., 2009; Neal, Griffin & Hart, 2000; Zohar, 2002), but this finding has not been universal (Cooper & Phillips, 2004; Garavan & O'Brien, 2001; Vredenburgh, 2002). Michael et al. (2005) have noted indirect effects of a strong safety climate. They observed a significant relationship between a positive safety climate and increased job satisfactions, organizational commitment and job-related performance. The implications from their work are that employee perceptions of a strong management commitment to safety may have other positive outcomes as well.

Although safety climate has been examined by many researchers, replication and validation of the effect of safety climate on employee behavior has been limited in many cases because few safety climate instruments have been used multiple times or in multiple work environments (Seo et al., 2004). After over 30 years of research on the topic (Zohar, 1980), the 2002 study by Zohar was one of the first to confirm that worker perceptions of safety were significantly linked to accident and injury rates. Even so, additional research is needed to validate and strength the findings by Zohar (2002) and others so that safety climate can be used with greater confidence by researchers to predict employee behavior.

 Indeed, finding a valid predicting factor for employee behavior remains a challenge for safety researchers. Several researchers have noted the limitations of using safety climate to measure employee perceptions, notably non-random response bias and measurement error (Guldenmund, 2007; O'Connor et al., 2011). Safety climate has potential as a predicting or leading indicator of employee behavior, but in addition to the limitations noted above, a lack of conclusive predictive power and limited acceptance from industry has also curtailed efforts to use this metric (Keren et al., 2009). This detail has not prevented safety researchers from attempting to model safety climate against a variety of factors, including trust.

Although few studies have tested the impact of trust on safety climate, low trust levels have been linked to many negative safety and organizational outcomes. Several factors may contribute to the negative safety

and organizational outcomes. First, a lack of trust in administrators may divert the employees' attention from their assigned tasks (Mayer & Gavin, 2005). Moreover, employees who are concerned or worried about the behavior of their boss may not be focusing on improving their own work or concentrating on their personal safety. Additional outcomes of low trust work environments may include increased attempts to break management rules or setting inappropriate goals contradicting to the organizational objectives (Davis et al., 2000). Although Davis et al., (2000) did not test safety specifically, setting inappropriate safety goals or attempting to "get away" with not following safety rules could prove extremely dangerous and possibly deadly.

Zohar and Luria (2005) presented a multilevel model of safety climate based on a theoretical framework previously outlined by Zohar (2000, 2003). The model attributes some variation in safety climate to the dynamics of the work group. This model assumes that employees are continually presented with a large number of inconsistent and conflicting demands from both management (termed organizational climate) and supervisors (work group climate). A second assumption is that although the management may create and develop policies and regulations, the daily implementation of the resulting actions and tasks are left to the supervisor. Supervisors are often left to interpret management mandates with a great deal of flexibility, resulting in variation between supervisory groups. Based on these assumptions, the implications from Zohar and Luria's (2005) work are clear. When employees and supervisors are faced with competing demands, they will choose the behavior that is perceived to be the higher priority. If the priority behavior is safety, the choice will be safe behaviors. If the productivity has the higher priority, tasks will be completed with speed in mind rather than safety. A second implication also suggests that employee perceptions could play a large role in what these priorities are and what resulting actions will be taken – safe actions or unsafe actions. Therefore, based on Zohar and Luria's (2005) theory, a lack of trust between employees and their management and supervisors could negatively impact employee perceptions, which may then negatively influence the safety of employee decision choices.

Kath, Magley, and Marmet (2010) were able to demonstrate a significant relationship between trust and safety climate. They also noted a stronger relationship between safety climate and trust in situations where the workgroup had an enhanced focus on safety. The finding aligns with Zohar and Luria's (2005) observations on the importance of supervisors' commitment to safety and the employees' perceptions of their supervisors' commitment within the work environment.

Similar findings were observed by others. Simard and Marchand (1995) point to factors at several levels which could influence employee behavior,

including micro and macro organizational levels. They report that micro level factors such as work processes, hazards, and work group cohesiveness contribute to workers' willingness to follow safety protocols. In their work, they found that many micro level factors are influenced by macro-level factors such as managerial support and commitment. However, after an accident, several researchers have noted the difference in perceptions between managers and first-line supervisors and co-workers of the victim. While management personnel generally attribute accidents to attitudes, knowledge, and behaviors of workers, supervisors and colleagues of the victim are more likely to blame the work environment, systemic weaknesses in safety or simple bad luck (Kouabenan 2009; Prussia et al. 2003; Walker 2010). Resolving and understanding this disconnect will provide a great deal of future study for safety researchers.

### Trust and Safety in the Workplace: Implications and Conclusions

Implications from research on safety climate and safe behaviors suggest managers and supervisors should focus on developing a proactive environment which promotes safe behaviors rather than a punishing environment which reacts to injuries and incidents (Johnson, 2007; Zohar, 2000; Zohar & Luria, 2005). This finding was echoed by Vredenburgh (2002), who examined safety training as a method of creating a proactive safe environment. Her study of management practices in a hospital setting concluded that although safety training should be used, it is not adequate when used alone.

Although Vredenburgh (2002) found safety training to be less effective when used without corresponding safety messages, other researchers have found safety training to be important predictors of safety climate (Mullen, 2004; Neal et al., 2000; Wu et al., 2007). Wu et al. (2007) concluded that additional safety training would lessen employee risk exposures and improve employee safety behavior, resulting in fewer incidents. This study also suggested safety training would improve the employees' emergency responses to safety incidents. In an agriculture setting, Murphy (2003) notes that although educational approaches have been used in the past, long term effectiveness and behavior change as a result of the educational intervention is questionable. However, he does not advise the abandonment of educational approaches.

Das et al. (2008) note that safety climate has a significant perceptual component. This means employees may recognize and construe information or episodes quite differently and the management and supervisors may have little control over these perceptions. Keren et al. (2009) reiterate this, stating that employees do not respond directly to workplace incidents, but perceive and interpret events which occur in their work environment

before taking action. Based on these observations, management and supervisors should be prepared to set a positive safety example, not only by their words, but by their actions as well. McLain and Jarrell (2007) and Arboleda et al (2003) both cited strong management support as an important component of safe work environments, with McLain and Jarrell (2007) specifying a positive pressure to work safely (i.e. a positive safety climate) as a significant predictor of safe work behavior. Arboleda et al. (2003) also included employee safety input as a significant variable their model of safety behavior. Open communication (as part of a high trust environment) and an open learning environment, where safety issues are discussed and analyzed, has also been shown to play a role in safe worker behaviors (Cavazza & Serpe, 2009; Pousette, Larson, & Torner, 2008).

Involving workers in the development of safety programs may limit incorrect perceptions of the workers. Because perceptions are not necessarily based on fact, but rather the employees' interpretation of facts, correct information about group safety perceptions is important information for managers and supervisors (Clark & Payne, 1997). Even after over 30 years of research attempting to predict workers' safety behavior, researchers still have no conclusive model to predict accidents before they occur. They are limited to analyzing the accident after the fact, which is subject to a great deal of bias.

Although post-accident analysis provides valuable information, understanding factors which predict or characterize unsafe employee behaviors before they occur would be an even better tool for managers and supervisors. No previous model has been able to explain or predict safe behaviors before they happen, but this has not kept researchers from attempting to understand why workers behave in an unsafe way. Decision-making analysis offers one method for understanding why workers take unsafe risks on the job. Decision-making theory applicable to safety climate is discussed in the next section

## A LITERATURE REVIEW: DECISION-MAKING THEORY

Decision-making research within the safety environment offers a potential tool to help understand why employees behave in unsafe ways. Research completed by Keren et al. (2009) established a framework for an examination of the relationship between safety climate and safety decision-making, where the decision making process reflects proximate behavior. The concept is defined by processes which are thought to play a role in the safety-related decisions employees make on the job as well as existing theories on the decision-making process.

Safety decisions are often made under risky conditions. Traditionally, a fundamental basis for risky decision-making has been the Expected Utility

Theory (EUT) which posits that when people make risky decisions, they weigh several options and the likelihood of each occurring (Newell, Lagnado & Shanks, 2007; Zohar & Erev, 2007). The option with the highest "utility" to the decision-maker is the final decision choice. However, the process is not always so straightforward. When comparing benefits between safe behaviors and unsafe behaviors under the framework of the EUT, unsafe behaviors are clearly favorable to the employee in terms of effort and time expended (Zohar & Erev, 2007), even though the decision choices are obviously unsafe and therefore, have a lower utility to the decision-maker. The choice of an unsafe option also refutes the long held assumption that self-preservation outweighs other employee motivations (Maslow, 1970).

Several violations to the EUT have been noted by researchers over the years. One prominent theory which challenges the fundamental postulation of the EUT to explain risky decision-making is the Prospect Theory (Kahneman & Tversky, 1979). The Prospect Theory (PT) counters the EUT by suggesting that people are more apt to give more attention to low-probability situations than to higher-probability occurrences (Tversky & Wakker, 1995). This theory also states that when a person stands to gain, risk adverse behavior is more common while those who perceive that they have nothing to lose exhibit more risk-seeking behavior. Newell et al. (2007) state that actual probabilities are often ignored by decision makers who underestimate common outcomes and overestimate rare outcomes. Additionally, Kahneman and Tversky (1979) demonstrated that decision-makers are more affected by decision outcomes that have a high probability of actually occurring rather than those that have a lower chance of happening, implying that people are more sensitive to risk than uncertainty. In a safety context, this implies that the regularity of following safety protocols could actually de-sensitize employees to the dangers on their jobs. Employee indifference to job hazards could lead to unsafe decision choices and a cavalier attitude toward safety protocols, as described by Walker (2010).

Murphy (2003) notes two additional behavioral models which could be applied in a safety scenario. These models are the Theory of Reasoned Action and the Theory of Planned Behavior. Both hypothesize that behavioral intentions immediately precede behavior. In both theories, the person will follow their intended action if the said behavior will lead to a desirable outcome, if others value the behavior, and if necessary resources and opportunities are available to support the behavior (Murphy, 2003). A positive safety climate could play an important role in this scenario, with the hypothesis being that a positive safety climate could predict a positive (and desirable) safety decision, resulting in positive safety behavior.

Another position on the Theory of Planned Behavior is offered by Fogarty and Shaw (2010) which examines human error. Psychologists differentiate simple errors in safety (defined as unintentional) from safety violations, in which employees willfully disregard safety procedures. Fogarty and Shaw (2010) argue that safety violations are explained by the psychological Theory of Planned Behavior.

In a safety context, the Theory of Planned Behavior is based on the idea that a person's behavior is a direct result of both their intentions and their perceived behavioral control. In turn, intentions are shaped by attitudes, subjective norms, and perceived behavioral control. In a work environment, subjective norms such as the climate for safety are perceived by employees based on behaviors and expectations of managers, supervisors, and co-workers while a person's prominent beliefs, such as their trust in their manager and supervisor, form the basis for many of their attitudes. Perceived behavioral control is rooted in behavior intentions, based on the individual's perception of the ease or difficulty of performing a specific behavior. Therefore, if an employee felt that performing a safe action was more difficult than performing an unsafe action, the theory posits that the employee would choose the unsafe action. The model constructed by Fogarty and Shaw (2010) using the Theory of Planned Behavior included several significant variables. These included management attitude, self-attitude, group norms, workplace pressures, the intention of the employee to violate the safety procedure, and the actual violations of employees. The variables accounted for a large proportion of the variance in both the employee's intent to violate and actual employee violations. In the trust and safety climate relationship, the concepts of management attitude, group norms, and workplace norms all have a high potential to influence both employee perceptions and their decision choices.

Although several behavioral theories exist to explain safe worker behavior, Murphy (2003) states that even though the theories have wide acceptance, limitations do exist. Two limitations are especially relevant to the safety decision-making process. The first is the issue of variance explained. Most models and theories of human behavior explain only a small amount of variance, meaning that human behavior can never be fully explained by these theories. Second, many intended behaviors are never actually carried out. This is the case, not only in cases of public health and safety, but also in workplace safety intentions. Most models do not account for those who fail to convert intentions into actions (Murphy, 2003).

When attempting to measure employee decision-making, the theoretical assumptions and hypotheses noted above must be taken into account. The methodology known as decision process tracing is one

option of addressing the difficulty in data collection while continuing to respect relevant assumptions and previous findings in decision-making.

Process tracing examines the thought processes of employees and has several key advantages over self-reported questionnaires, which depend on recall ability and researcher observation of work behavior, which is cross-sectional at best and may have serious bias related to the Hawthorne and other effects (Ford et al., 1989). Decision process tracing also has benefits not realized with structural modeling. The former focuses on the processes humans use to analyze and gather information in preparation to make a decision choice while the later emphasizes the outcome of the decision choice (Ford et al., 1989). Mintz (2004) adds another strength of the process tracing methodology – the ability to isolate decision rules and models used in the decision-making process as well as test the association of situational and personal factors with the decision process and the final decision choice.

Decision process tracing is an approach used to capture direct cognitive processes by directly evaluating the information an individual uses to form a judgment and the sequence with which the information was examined (Ford et al., 1989). Other key processes recorded include: the number of alternatives viewed, the time needed to make a choice, and the final decision. To gather this information, two methods are used: the decision board or the verbal protocol. Decision boards display possible alternatives for the decision maker while verbal protocols require the decision maker to describe to researchers what they are thinking or doing as they move through the decision process (Ford et al., 1989).

When data are available on each employee's perception of trust and safety climate and compared against the decision choice and decision-making process, the outlines of a model can be developed. A model which describes the relationship of employee trust and safety climate with the decision choice and decision-making process is the next step in this research. With a valid model, targeted training and safety intervention can be developed with a goal of preventing unsafe decision choices before they happen.

## OUTCOMES, LIMITATIONS, AND FUTURE DIRECTIONS

The process of measuring trust, safety climate, and the decision-making process has several limitations. Limitations on the measure of trust and safety climate are noted in those sections of the manuscript. Limitations of decision process tracing are described below. The decision process tracing

methodology measures one specific and hypothetical decision scenario at a time. Therefore, conclusions from one decision scenario may not be extrapolated to other workplace settings or scenarios. Second, because the methodology uses human responses, it is subject to the normal limitations of using human response data (i.e. selection bias, measurement error, and user error). In addition, decision process tracing is typically a computerized procedure. Consequently, the level of computer literacy held by the participants could potentially impact the quality of the data. Finally, the relative newness of decision process tracing in safety environments mean that researchers are still learning the most appropriate and valid ways of measuring human decision-making. Some results may require further investigation and the use of other tools to fully understand and validate the outcomes.

Based on the review of literature in the areas of trust, trust and safety and the workplace, and decision-making theory, together with recommendations from baseline research by Keren et al. (2009), Mosher (2011), and Bayouth (2011), future work in the area of safety decision-making should emphasize the following knowledge gaps:

- Influence of personal characteristics such as authority level, power distance, tenure, and level of safety training on decision-making patterns

- Increased emphasis on external factors influencing the decision-making process, including peer pressure, stress levels, and the relationship between the employee and the supervisor and management

- Continued study of the interaction between safety climate responses and the decision to act safely is needed to validate and refine safety intervention and education in the work environment

- The use of decision-making data in system safety quantitative tools to better estimate and define risk pathways

- The development of safety decision scenarios for diverse situations

The use of decision-making analysis in the safety environment offers great potential to the field of occupational safety and industrial technology, especially when combined with human-based measures such as trust and safety climate. Enhancing the understanding of factors which influence employee decision-making choices will play an important role in the management of occupational safety across multiple work environments. Existing research has established a baseline of information but has raised even more research questions within the field of industrial technology and safety.

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