# Relationships between organizational climates and safety-related events at four wood manufacturers


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## Abstract

Most segments of the wood manufacturing industry place a great deal of emphasis on production in order to meet daily or weekly productivity quotas. Unfortunately, conflicts often exist between productivity and employee safety, as well as between productivity and quality. The perceived emphasis placed on each of these areas by an organization's management will cultivate a corresponding climate within the workforce. This study examined the relationship between production employees' perceptions of productivity and quality climates and safety-related events. Data were collected with surveys of 526 production employees at 4 secondary wood products manufacturers in Pennsylvania. Results suggest that an increased emphasis on productivity is related to an increased number of incidents, while a stronger safety climate had an inverse relationship. These results imply that productivity climate is a useful factor in understanding employee safety-related incidents, and that managers should attempt to strike a better balance between climates for productivity, quality, and safety.


Wood products manufacturing operations are often highly labor-intensive with a strong production orientation. Hourly employees must often work at a fast pace, sometimes compromising their health and safety. As is often the case, such labor-intensive manufacturers may put their strongest emphasis on production in order to meet productivity quotas (Rinefort 1998). This emphasis, however, is what can lead to the conflicts between safety and productivity (Kelly 1996), and between productivity and quality (Parasuraman 2002).

Conflicts such as these are a result of the various climates that can exist within an organization, including *safety climate* (Zohar 1980, Hofmann and Stetzer 1996), *quality climate* (Noronha 2002), and *productivity climate* (Gareth 1983). Although literature supports a negative relationship between safety climate and accidents (Zohar 1980, Hofmann and Stetzer 1996), the effects of productivity climate and quality climate are less clear with respect to safety performance.

The objective of this study was therefore to investigate the relationships between organizational climates (e.g., safety climate, productivity climate, and quality climate) and employee safety-related events. We specifically sought to determine if any unique variance in safety-related events was explained by productivity climate and quality climate. Our emphasis was on productivity and quality climates in part because many prior studies have addressed safety climate; our presumption, based on those past works, was that an organization's safety climate does influence injuries and safety-related events (Hofmann and Stetzer 1996, Barling et al. 2002).

Our overall goal was to provide information that can be used by wood industry managers to decrease the number of


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injuries and safety-related events that occur in their facilities. The Occupational Safety and Health Administration (OSHA) requires that actual injuries be recorded; however, many other safety-related events (e.g., sawdust in eye, tripping over an object, etc.) are indicative of unsafe conditions and can have detrimental effects even though never documented. For example, accidents and near-misses have been shown to decrease employee morale, job satisfaction, and organizational commitment, while increasing intention to quit (Abler 1979, Reppert 1988, Brogan 1991). Moreover, studying safety-related events (e.g., employee unsafe practices) is relevant because they often lead to incidents that have the potential to cause injury or damage (Spears 2002). Spears also states that unsafe acts and conditions are often indicative of an overall organizational problem such as insufficient management commitment to safety. Kelly (1996) corroborates this notion with the assertion that whatever management permits, management condones. For example, if management allows employees to compromise their safety then the unsafe behaviors, in many cases, become routine and may eventually lead to a mishap, injury, or fatality.

Perhaps due to the nature of the majority of reported injuries or safety-related events at wood products manufacturers (e.g., strains, twists, sprains, etc.), most research with respect to employee safety in our industry has been focused on ergonomically based issues (e.g., Smith et al. 2000, Monica et al. 2001, Gazo et al. 2002). Industry trade groups such as the American Furniture Manufacturers Association have also put a great deal of emphasis on ergonomics (Perdue 2002). However, many safety experts believe that the most productive path to reducing accidents is through a greater understanding of the cognitive and behavioral aspects of employees (e.g., Geller 1996). Thus, our hope was to utilize techniques from industrial psychology and organizational science to help the industry better understand how these areas might be used to decrease accident rates.

## Linking organizational climates and safety performance

One of the reasons to investigate organizational climate as an influencer of safety-related events is the recent literature that has begun to highlight the impacts of climate on organizational performance. In addition, climates for productivity, quality, and safety are influenced by management actions and therefore presumably are components of the organization that can be manipulated once their importance is understood. The following section will discuss the three types of climates utilized in our research.

Safety climate is often defined as an employee's attitude or belief toward safety in their working environment (Hofmann and Stetzer 1996). A strong safety climate within an organization has been shown to influence work-related incident rates (Zohar 1980). Dedobbeleer and Beland (1991) found relationships between safety climate and both OSHA-recordable accidents and unsafe behaviors. Varonen and Mattila (2000) examined the relationship between safety climate and work environment, and the relationship between safety climate and safe practices in eight wood-processing companies in Finland. They concluded that there was a relationship between safety climate and safe practices at the companies.

Other research has found relationships between occupational injuries and perceived safety climate, safety consciousness, and safety-related events (Barling et al. 2002). In Barling's case, safety climate was defined as the employee's perceptions of the organization's policies, procedures, and practices concerning occupational safety. Climate also helps employees to make sense of the priority accorded to occupational safety within the organization. Barling et al. (2002) further argued that management actions directly affect perceived safety climate.

Quality climate also is an important consideration for most manufacturing industries. For our purposes, quality climate is interesting because in some manufacturing environments a greater emphasis on quality would result in slower productivity rates and perhaps fewer accidents. Noronha (2002) defined quality climate as employees' perceptions regarding the quality objective of the organization. He examined the impact of Chinese culture on Total Quality Management (TQM) efforts by looking at how value orientations influence the quality climate and ultimately the achievement of quality-related goals. Unfortunately, little additional research has been conducted with respect to quality climate. Most articles that highlight quality climate focus on addressing or promoting the benefits of Total Quality Management, which does address some issues with respect to employee safety, but these are primarily ergonomically based. However, no known empirical research has been done with regard to employees' perception of quality climate and its effect on accidents.

For the purpose of this paper, we derived the term productivity climate from productivity culture (Kupers 1998). We defined productivity climate as employees' attitudes and beliefs with respect to management's emphasis on production in their working environment. Although no known research has been conducted on productivity climate and safety, literature supports a positive relationship between performance pressure and safety performance (Hofmann and Stetzer 1996).

## Methodology

Data were collected during the fall of 2003 from hourly production employees at two furniture and two cabinet manufacturers in Pennsylvania. All employees were surveyed ($n = 110$) at one of the solid wood furniture manufacturers, with 50 employees surveyed at the other. In the latter case, all 25 employees who had been injured (i.e., had an OSHA-recordable incident) during the previous 6 months were chosen to participate, as well as 25 non-injured employees who were randomly chosen from the entire hourly workforce. Likewise, for 1 of the cabinet manufacturers 100 percent of the employees were surveyed ($n = 334$), and for the other cabinet manufacturer 37 injured employees and 37 non-injured employees (randomly chosen) were surveyed. The large size of the workforces at two of the plants precluded surveying the entire populations.

The surveys were pretested at a large upholstered furniture manufacturer. Results from that survey are not included in this paper, but the pretest allowed modification of the original survey to remove confusing items. Surveys were administered in a neutral setting (e.g., cafeteria or break room) away from the employees' normal working environment in order to reduce potential biases due to noise, interruptions, presence of supervisor, etc. A total of 568 production employees from the 4 companies completed the surveys; 526 usable surveys were returned.

Table 1. — Means, standard deviations, reliabilities, and correlations among variables included in the survey.[a]

| | Mean | SD[b] | Cronbach alpha | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Safety climate | 3.58 | 0.59 | 0.89 | -- | | | | | | | |
| 2. Quality climate | 3.50 | 0.71 | 0.71 | 0.611** | -- | | | | | | |
| 3. Productivity climate | 3.44 | 0.61 | 0.69 | -0.534** | -0.414** | -- | | | | | |
| 4. Safety-related events | 18.00 | 5.57 | 0.71 | -0.321** | -0.153** | 0.341** | -- | | | | |
| 5. Perceived danger | 2.77 | 1.05 | n/a | -0.180** | -0.019 | 0.147** | 0.272** | -- | | | |
| 6. Hours of safety training | 2.11 | 1.02 | n/a | 0.099* | 0.015* | -0.073 | -0.083 | -0.020 | -- | | |
| 7. Tenure | 9.55 | 8.63 | n/a | -0.039 | 0.036 | 0.000 | -0.132** | 0.107* | 0.071 | -- | |
| 8. No. of wood companies worked for | 2.05 | 0.37 | n/a | -0.012 | 0.004 | -0.060 | 0.081 | 0.074 | 0.039 | 0.257** | -- |

[a]* = $p < 0.05$; ** = $p < 0.001$.
[b]SD = standard deviation.

Hierarchical multiple regression was used to determine the amount of variance in employee safety-related events explained by the productivity and quality climates. This regression technique is a commonly used statistical test for evaluating the contribution of the variables of principal interest (i.e., the organizational climates) to the explanation of observed variance in the dependent variable (safety-related events) after controlling for the influence of covariates. The variance not accounted for by safety climate or by the covariates (e.g., perceived dangerousness, hours of safety training, tenure, number of wood products companies worked for, mill, and gender) was the variance of interest in this model. Covariates are considered control variables in hierarchical multiple regression and are hence entered into the first model. This technique then requires a second model run with safety climate added as a predictor variable. A significant F-value indicates that the variables added in the second and third models account for a statistically significant increase in variance explained.

## Measures

The following sections describe each of the important constructs used in this project. Readers will note that the constructs were taken from previous research in which they had been validated. Each of the climate constructs was measured using a 5-point Likert scale (1 = strongly disagree; 3 = neutral; 5 = strongly agree).

*Safety climate.* — Safety climate was measured using 17 revised items from Zohar's (1980) safety climate scale. Employees were asked to rate how much they agree or disagree with statements related to their perception of safety climate at their company. Examples of items used include "Upper management at this company does as much as possible to make this a safe place to work" and "My supervisor does not seem to care about my safety."

*Productivity climate.* — Productivity climate was a five-item measure based on Hofmann and Stetzer's (1996) safety climate survey. Items included "Our upper management does everything possible to make sure productivity goals are met" and "My supervisor sometimes allows employees to take shortcuts in order to meet productivity goals."

*Quality climate.* — Quality climate was a six-item measure based on Hofmann and Stetzer's (1996) safety climate survey. An example of the statements rated by employees was "My supervisor is always willing to consider suggestions on improving product quality."

*Safety-related events.* — Safety-related events were measured using seven revised items from the Barling et al. (2002) safety-related scale. A scale with anchors ranging from *never* to *five or more times* was used to measure employee responses. Examples of events included "I tripped over something on the plant floor," "I dropped a heavy object on a body part," and "An object got stuck in my hand while working." Employees were told to respond based on events that had occurred during the previous 12 months on the job. Each person's responses to the seven items were summed to derive the variable "*safety-related events*." Self-reports of safety behaviors and perceptions are commonly used in safety research, and are in some ways preferable to using information available from management (Thompson et al. 1998)

*Control variables.* — Perceived dangerousness was measured using one item from Morrow and Crum's (1998) scale. Employees were asked to rate how dangerous they felt their particular job was. A 5-point Likert scale was used to measure their responses with anchors ranging from *not at all dangerous* to *extremely dangerous*. Employee gender and company tenure were collected from the survey and verified by the Human Resources Manager's employee database. These also were used as control variables. Mill was included as a covariate (control variable) so that differences in physical environments, types of jobs, and other between-mill factors not otherwise captured by the defined variables could be evaluated for their combined effect on safety performance.

## Results

In total, 526 usable employee surveys were completed and analyzed. Approximately 77 percent of the employees were male, 91 percent were white, and 49 percent were married. The median age was 38 years; the median job tenure was 7 years.

The means, standard deviations, correlations, and Cronbach's alpha coefficient (test of the reliability or consistency of scaled-responses to similar questions) estimates are presented in **Table 1**. All scales had a Cronbach's alpha of at least 0.70 as recommended by Nunnally and

*Table 2. — Distributions of responses for frequency of safety-related events during the previous 12 months.*

| Safety-related events | Never | Once | 2 to 3 | 4 to 5 | >5 |
|---|---|---|---|---|---|
| | Frequency[a] | | | | |
| I got some foreign matter (e.g., wood chip, sawdust, chemical) in one of my eyes. | 144 | 120 | 127 | 42 | 90 |
| I tripped over something on the plant floor. | 97 | 87 | 145 | 61 | 131 |
| An object got stuck in my hand (e.g., splinter, nail, staple, etc.) while working. | 58 | 32 | 113 | 69 | 252 |
| My clothes got caught in something (e.g., a piece of machinery) while working. | 430 | 44 | 30 | 7 | 12 |
| I slipped on sawdust, scrap wood, liquid substances, or other objects on the plant floor. | 261 | 95 | 102 | 27 | 38 |
| I came in contact with dangerous equipment (e.g., sawblade, heavy equipment, etc.) that almost caused an injury. | 397 | 69 | 33 | 7 | 19 |
| I dropped a heavy object (e.g., board) on body part (e.g., foot). | 259 | 108 | 101 | 19 | 34 |

[a]Frequency categories were aggregated in the table to enhance readability.

*Table 3. — Hierarchical regression of employee safety-related events with perceptions of organizational climates.[a]*

| Independent variables | Model 1 | Model 2 | Model 3 | Model 3 partial correlation |
|---|---|---|---|---|
| Perceived dangerousness | 6.62** | 5.72** | 5.30** | 0.217 |
| Hours of safety training | -1.90 | -1.17 | -1.24 | -0.051 |
| Tenure | -2.62* | -3.90** | -4.03** | -0.165 |
| No. of wood companies worked for | 2.31* | 2.14* | 3.26** | 0.134 |
| Mill | -2.03* | 0.221 | 0.260 | 0.011 |
| Gender | 1.36 | 1.84 | 2.11* | 0.087 |
| Safety climate | | -6.67** | -3.95** | -0.162 |
| Productivity climate | | | 4.76** | **0.195** |
| Quality climate | | | 1.59 | 0.065 |
| $r^2$ | 0.128 | 0.206 | 0.246 | |
| Adjusted $r^2$ | **0.117** | **0.194** | **0.231** | |
| Change $r^2$ | | **0.078** | 0.040 | |
| F | 11.09** | 16.76** | 16.30** | |

[a]The values in Models 1, 2, and 3 represent t-values; * = $p < 0.05$; ** = $p < 0.001$.

Bernstein (1994). Cronbach's alpha cannot be calculated for variables consisting of only one item (e.g., perceived dangerousness). The correlations between the numbers of employee-reported safety-related events and the variables safety climate (negative correlation), quality climate (negative), productivity climate (positive), perceived danger (positive), and employment tenure (negative) were all highly significant. The only non-significant correlations for the variable "safety-related events" were with the variables "hours of safety training" and "number of wood companies worked for."

**Table 2** provides the distributions of the employee responses for the number of safety-related events that were encountered during the 12 months prior to survey administration. The event that was reported with the greatest frequency was getting a foreign object stuck in a hand. Nearly half of the respondents reported that during the previous year they had experienced at least five instances of this type of event.

Hierarchical regression analysis was used to determine if employees' perceptions of productivity climate and quality climate explained any unique variance in self-reported safety-related events that was not explained by employees' perception of safety climate and the control variables (i.e., perceived dangerousness, hours of safety training, company tenure, number of years worked in a wood products company, mill, and gender). The controls were entered into Model 1 of the linear regression routine (**Table 3**) in order to calculate the amount of variance explained in employees' self-reported safety-related events. The controls explained 11.7 percent of the variance in employee self-reported safety-related events (F = 11.09, $p < 0.001$).

Employees' perception of safety climate was entered into Model 2 (**Table 3**). After removing the effects of the controls, safety climate accounted for an additional 7.8 percent of the variance in employee self-reported safety-related events (F = 16.76, $p < 0.001$). The controls and employees' perception of safety climate combined accounted for 19.4 percent of the variance in employee self-reported safety-related events.

Employees' perception of productivity climate and quality climate were then entered into Model 3. After removing the effects of the previous variables, productivity climate accounted for an additional 4 percent of the variance in employee self-reported safety-related events (F = 16.30, $p < 0.001$). Quality climate, on the other hand, did not account for a significant amount of additional variance in employee self-reported safety-related events. Combined, the independent variables account for 23.1 percent of the variance in employee self-reported safety-related events.

## Discussion

As expected, the employees' perception of productivity climate was positively related to their self-reported safety-related events. In simpler terms, those employees who perceived a stronger climate for productivity in their positions (i.e., believing that their managers/supervisors emphasize productivity the most) reported higher numbers of safety-related events. This suggests that "micro-climates" can exist at the level of a single person or group, and that a localized emphasis on productivity can force an increase in risky behaviors that may eventually lead to incidents or accidents. Although there are advantages to promoting productivity in a manufacturing organization, the results suggest disadvantages as well. Employees' perceptions of productivity climate explained some unique variance in safety-related events that was not explained by employees' perception of safety climate or by the covariates. This implies that employees' perception of productivity climate is indeed a useful factor in understanding the cause of safety-related events.

Predictably, the results suggest that employees' perception of safety climate is negatively related to the frequency of safety-related events (Barling et al. 2002). In other words, there will be fewer incidents in a working environment in which employees are encouraged to work safely and in which supervisors put considerable emphasis on safety. This again implies that climates are likely felt at the individual or group levels, and that efforts should be made to keep these from being weakened due to an emphasis on productivity.

Another interesting finding is that employees' perception of productivity climate was negatively related to their perception of quality climate (**Table 1**). This implies that the companies we surveyed had not been effective at cultivating high levels of both climates in their hourly workforce. Given that all four of these producers were in the value-added segment (i.e., close to the consumer) of the wood industry, it seems as though strong climates for both quality and productivity should be cultivated.

### Management recommendations

The results of the current research have important implications for upper-level management, supervisors, and safety directors. The general message is that safety climate and productivity climate seem to influence employee safety-related events. With that in mind, managers and supervisors should concentrate on fostering a strong safety climate within their organization in order to decrease work-related injuries or events. Fostering a positive safety climate, however, requires management commitment and supervisor support for safety. One of the ways that management can promote the safety climate of an organization is by making sure the production environment is kept in good working condition. Becker (2001) states that good housekeeping will help to eliminate safety problems, improve morale, and increase efficiency and effectiveness. He also adds that this concept is most attractive to production managers when coupled with the fact that such a workplace will also yield improvements in productivity and quality, while lowering product costs and enhancing the flexibility of operations.

Safety directors can have a direct impact on safety climate by convincingly communicating management's safety-related values, beliefs, and concerns to every employee. Combined, these will help create a more positive safety climate. As previously mentioned, conflicts often exist between production and safety, and therefore, in many cases, conflicts may exist between production managers and safety directors. Safety directors, production managers, and supervisors should have a good working relationship to achieve the safety goals of the organization. Safety directors, production managers, and supervisors should also communicate on a regular basis on safety-related issues and methods for improvement.

Open communication between safety directors and hourly employees can also be used to improve the safety climate. For example, employees should be encouraged to report unsafe working conditions, accidents, and mishaps. Mishaps are often defined as close calls or near misses. In many cases, employees do not have any problem reporting unsafe working conditions or accidents, but are reluctant to report mishaps. However, if mishaps are reported, corrective actions can be taken by the safety director and/or production manager to prevent the possibility of future work-related injuries. Once reported, safety and supervisory personnel must act quickly to identify the root cause of the problem and implement a remedy (Friend 1997).

### Limitations

Researchers and managers alike will acknowledge that predicting human behavior with a high degree of certainty is difficult. That we only accounted for less than 25 percent of the variance in safety-related events may seem quite low to those not used to working with human subjects. This figure, however, is quite respectable for this type of research and reflects the challenges of attempting to predict an occurrence such as getting a foreign object stuck in one's hand. The inability to account for higher levels of safety-related events is a limitation of this study, and yet the results provide clear direction for industry managers seeking to increase safety performance at their mills.

This research is based on data collected with questionnaires and therefore limitations may apply. Additional limitations may include the employees' abilities to read and comprehend the survey items. The reading and writing level for each respondent was unknown; therefore, results may have been biased by a lack of understanding of the survey questions or statements by some respondents. In addition, some respondents may have been selective on what they reported due to internalized social pressures/expectations (i.e., social desirability responses). Finally, due to the fact that cross-sectional data (e.g., collected at one moment in time) were used for this research project, we were unable to determine causality between employees' perceptions of productivity climate and actual incidents or safety-related events.

## Conclusions

Findings from this research suggest that organizational climates may play an important role in understanding on-the-job accidents and safety-related events. Although having a strong productivity climate may offer some advantages for a wood manufacturer, management must realize the trade-offs of emphasizing this type of climate. Over time, the costs associated with the consequences of a high-production working environment (e.g., employee injury, lower quality, etc.) could be detrimental to an organization. Conversely, fostering a climate for safety should reduce safety-related events and injuries and reduce the associated costs. A weaker safety climate may occur when upper management considers employee safety as simply a priority as opposed to a true value. Making safety a priority of management is generally thought to be less effective since priorities can be compromised to satisfy another goal such as productivity (Kelly 1996).

We also suggest that upper management should strive to eliminate barriers that exist between departments (e.g., production, sales, safety, etc.). Unfortunately, upper management may unknowingly contribute to the conflicts between safety and production, and quality and production, by allowing sales to over commit on order quantity or delivery dates. Better communication between functions might reduce or eliminate the trade-offs that production management must make when attempting to meet such requirements.

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