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ScienceDirect
Journal of Loss Prevention in the Process Industries 21 (2008) 239–254
Journal of Loss Prevention in the process industries
www.elsevier.com/locate/jlp

Interaction effects of organizational and individual factors on safety leadership in college and university laboratories

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Received 15 February 2007; received in revised form 15 April 2007; accepted 19 April 2007

Abstract

Satisfactory safety climate and performance are necessary characteristics of a work environment where excellence is sought. Sound leadership is a prerequisite for both these elements. In the context of social systems theory, safety leadership behavior is the result of interaction between organizational and individual factors. Nevertheless, no evidence drawn from empirical investigations has yet been brought forward to support such an argument. The purpose of this study is to explore the interactive effects of organizational and individual factors on safety leadership in college and university laboratories. A self-administered questionnaire was distributed to a sample of 754 employees at four colleges and universities in central Taiwan. From them, 465 usable questionnaires were returned, corresponding to a 61.67% response rate. The results indicated that the correlation between safety leadership and individual factors varied according to organizational factors. Hence, the safety leadership perception of employees with various individual characteristics was found to vary with organizational factors.

Keywords: Safety leadership; Safety climate; Safety performance; Interaction effects; Laboratory safety

1. Introduction

1.1. Background

Of the four growth sectors (government, health care, education, and leisure) in the 20th century, two (education and health care) are expected to remain on the list of major growth sectors (Drucker, 1999). Universities, as part of the education system, are established for the goals of academic study, talent cultivation, culture enhancement, social service, and promotion of national development. Yang (1999) pointed out that the activities of universities should encompass many disciplines, be well integrated, show evidence of innovation, include a search for excellence, and criticize social defects. The search for excellence, one of these ideas, means that a university should function as a cradle for breeding and fostering great scholars, philosophers, and intellects. In other words, a university is a nursery for nurturing a future intellectual elite. As such, a university should have a high-quality academic program, a substantial education and research facility, and a high level of workplace safety.

Unfortunately, in Taiwan, frequent accidents or disasters in university laboratories in recent years have halted the universities' search for excellence. Twenty-one accidents causing injuries and death to students and instructors happened in university and college laboratories in Taiwan between December 1997 and May 2004 (Shu & Lin, 2004).

A university president often faces four fundamental ambiguities: ambiguities of purpose, power, experience, and success (Cohen & March, 1974). These ambiguities pose critical challenges to his/her leadership, including in the field of safety. Carrillo (2005), on the other hand, has maintained that leaders must develop sufficient capability

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doi:10.1016/j.jlp.2007.04.011

to accept and manage these uncertainties so that they can motivate employees' commitment to safety and eventually reach the goal of safety excellence.

Social systems theory describes safety leadership behavior as the result of interaction of organizational and individual factors (Getzels & Guba, 1957; Ornstein & Hunkins, 1993). Two-way ANOVA can analyze not only the main effects of organizational and individual factors on safety leadership, but also the interaction effects of these two factors (Lin, 1999). Interactive effects can exist both in experimental and non-experimental research. Interactive effects exist if the correlation between any two variables varies with the value of a third variable. If these effects are present, it is possible for researchers to draw incorrect conclusions by analyzing the main effects only (Zhu, 2002).

Stevens (1992) pointed out two advantages of a two-way design: (a) it enables the researcher to examine the joint effects of the independent variables on the dependent variables(s), and (b) it leads to more powerful tests by reducing error variance. Moreover, Stevens also noted three reasons for preferring a MANOVA over separate univariate analyses: (a) MANOVA takes into account important information, i.e., the intercorrelations among the variables, (b) MANOVA keeps the overall α-level under control, and (c) MANOVA has greater sensitivity for detecting differences in certain situations. For these reasons, two-way MANOVA may be a better way to analyze the interactive effects of organizational and individual factors on safety leadership.

1.2. Literature review

1.2.1. The concept of safety leadership

1.2.1.1. The concept of safety. The term "safety" has been in use for a long time. According to recorded Chinese history, safety as a term first emerged in the literature approximately 2000 years ago. However, few, if any, in-depth studies on the subject of safety have been carried out, because we have often taken it for granted (Liu, 1995). Safety implies an acceptable level of risk, relative freedom from harm, and low probability of harm (ASSE, 1988). Summarizing different opinions in earlier studies, Manuele (1993) defined safety as a state for which the risks are judged to be acceptable. Gloss and Wardle (1984) contended, however, that safety is a relative condition, and there is no such thing as absolute (100%) safety under any conditions.

Liu (1995) maintained that safety refers to an existing condition, which shields people from external hazards and a protective function, which provides people with healthy, comfortable, and highly efficient working conditions. Song (1997) defined safety as a state where, "people feel stable and comfortable and enjoy physical and mental health, while the work environment is kept in good order and tidy in the production process." Huang (1995) suggested that safety is a complex combination of mental, physiological, and physical conditions which are related to the knowledge, capability, experience, and working habits of people. In other words, injury or danger can be reduced when those conditions match people's knowledge and skill levels.

In summary, safety is a condition in which risk or hazard is controlled to an acceptable degree. Safety is a relative, not an absolute concept, i.e., there is no such thing as absolute safety, but only relative safety. Moreover, safety refers to a state in which people may efficiently and effectively complete their tasks in a healthy and comfortable environment. It is obvious that safety is easier to describe than to define.

1.2.1.2. The concept of leadership. Leadership plays an essential role in today's complex social systems (Parsons, 1991). Xu (1997) held that leadership refers to the use of influence in a management system, with the purpose of motivating members' willingness to work and of defining members' work direction. The paper goes on to show that without leadership, employees will lose their work motivation and direction, which will eventually undermine the organization's competitiveness. Leadership theory, although it has been evolving for over 100 years, has failed to come up with an exact and complete definition of leadership (Lee, 2003).

Hersey and Blanchard (1974) have pointed out that leadership is the process of personal interaction aiming to influence and direct people's behavior in a specific situation towards organizational goals. In Davis's (1984) opinion, leadership is the ability to persuade people to work towards attaining set goals. Hodgetts (1991) maintained that leadership aims to influence organization members and direct their effort towards a specific goal. Robbins (1993) defined leadership as the ability to influence a group toward the achievement of goals. Yukl (1998) proposed that leadership is the integration of personal traits, leadership behaviors, interaction modes, role relationships, and organizational goals, in short, the process through which a leader influences subordinates to attain organizational goals. The above arguments highlight important concepts such as "situation," "influence," "goal," "interaction," and "process".

1.2.1.3. The concept of safety leadership. As a subsystem of organizational leadership (Pater, 2001), safety leadership contributes to determining the quality of organizational leadership. Conceptualizing safety leadership is helpful in explaining how and why good organizational safety performance should be achieved. According to the preceding concepts and definitions of safety and leadership, we can define safety leadership as the process of interaction between leader and followers through which a leader can exert influence on followers to achieve organizational safety goals within the context of organizational and individual factors (Wu, 2005).

1.2.2. Related studies on safety leadership

In recent years, many studies on safety leadership have been published, describing significant concepts such as