

Interdisciplinarity

Increasing Safety Performance

By Judith A. Erickson

Keeping employees safe and healthy consists of much more than basic compliance measures such as guarding machinery or wearing PPE. Although these and other directly related safety and health activities are vitally important to employee welfare, optimal safety performance encompasses far more than OSHA regulations and compliance. To more effectively and efficiently discharge their responsibilities,

OSH professionals should be aware of and conversant in many disciplines and fields of knowledge. For example, OSH professionals must have working knowledge of chemistry, biology, physics, engineering, human anatomy and physiology, systems, toxicology, epidemiology, statistics and fire science, among others. In fact, one reason individuals choose the OSH field is because it requires such diversity of knowledge.

In addition to these so-called hard sciences, the so-called soft science disciplines have a direct and positive effect on the level of safety performance. Soft disciplines include organizational behavior, management, occupational psychology, learning theory, training, social psychology and human factors.

Interdisciplinarity & Multidisciplinarity

For the purposes of this article, multidisciplinary is defined as different disciplines working together without integration of their knowledge bases. Interdisciplinarity, on the other hand, integrates knowledge from different disciplines. It blends the assump-

tions and practices of each into an integrative relationship to accomplish a larger purpose such as improving safety performance. Therefore, safety professionals should strive to incorporate the well-established principles and findings of other related disciplines into their daily safety practices.

Individual Disciplines

A discipline is defined as of or relating to a specific field of study. Practitioners in each discipline have their own way of thinking and approaching problems (Choi & Pak, 2006). Therefore, each discipline perceives things somewhat differently.

Easy problems can be solved in a linear, single-cause/single-effect fashion, generally by analyzing them using one discipline. OSH professionals use this type of problem solving routinely and successfully, at least in the short term.

A one-dimensional evaluation and approach may be adequate to solve simple problems but is often not sufficient to comprehend the totality of a situation (Choi & Pak, 2006; Schuftan, 1988). This occurs because a one-discipline approach analyzes specific parts rather than an entire situation. Therefore, only partial bits of knowledge are applied to understand and explain what is occurring.

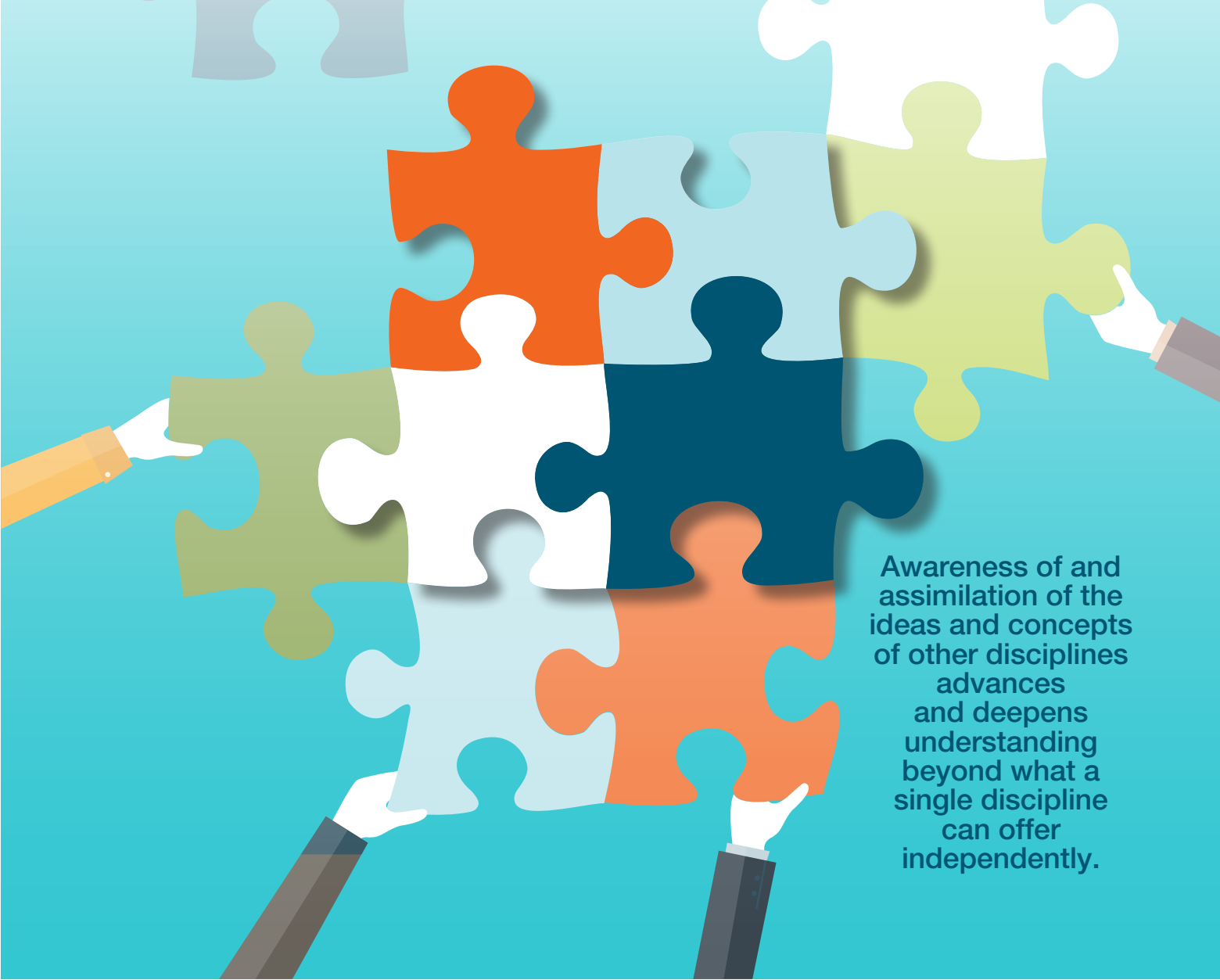
Even if a one-discipline approach achieves short-term gains, problems generally resurface if underlying causes are not identified and explored. In general, one-dimensional techniques tend to lead to an oversimplification of reality (Schuftan, 1988). An example of this is focusing solely on employee behavior as the cause of injury or incident causation. This approach does not consider the multitude of system factors that could influence, cause or affect that behavior. These factors must be considered and explained before one looks at employee unsafe acts as the fundamental cause of injuries and incidents. As Hollnagel (2014) says, "Explanations that are based on linear causality are dangerously oversimplified" (p. 150).

Underlying the rationale of preventing unsafe acts as major contributors of adverse events em-

IN BRIEF

- **Successful OSH professionals must possess a broad spectrum of knowledge from various fields and disciplines.**
- **In addition to the requisite OSH bases of knowledge, several other fields are directly applicable to OSH responsibilities.**
- **Diverse knowledge bases enhance injury prevention, hazard elimination or modification, and regulatory compliance.**
- **By incorporating non-safety-specific knowledge and research findings into the field of safety, OSH professionals become more interdisciplinary, thereby enhancing their ability to increase the level of safety in their companies.**

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phasizes the concept of human error. However, human actions occur within a context of organizational systems. Therefore, they should be understood and explored as such.

Many authors stress the importance of a systems context of organizational, social, personal, task and equipment failures over individual behaviors (Erickson, 1994, 2008; Woods, Dekker, Cook, et al., 2010). As Petersen (2001) says, "An unsafe act, an unsafe condition, an accident: all these are symptoms of something wrong in the management system" (p. 15).

Furthermore, according to Whittingham (2004), there is a temptation to:

(S)hift blame for an accident to human error at the operational level in order to divert attention from organizational deficiencies. However, accident causation is rarely so simple. Even if it were possible for a single error to cause an accident . . . the organizational systems that allowed the error to take place would still clearly be at fault. (p. 33)


Woods, et al. (2010), further state, "The issue is finding systemic vulnerabilities, not flawed individuals. Safety is an emergent property of systems,

not of their components" (p. 245). This assertion is stressed by Deming (2000) who states, "A fault in the interpretation of observations, seen everywhere, is to suppose that every event (defect, mistake, accident) is attributable to someone (usually the one nearest at hand)" (p. 314).

In essence, "the term *human error* is, however, of little use both because it is a catchall category and because it confuses actions and causes" (Hollnagel, 2014, p. 78) and, as Dekker (2012) states, "many . . . organizations have found that simplistic guidance about pigeonholing human acts does not take them very far. . . . Such assignments are nothing more than somebody's attribution" (p. x).

Goal of Interdisciplinarity

To move beyond single-factor causation, the goal of interdisciplinarity is to resolve complex problems by providing different perspectives of a situation (Choi & Pak, 2006). Awareness of and assimilation of the ideas and concepts of other disciplines advances and deepens understanding beyond what a single discipline can offer independently (Choi & Pak, 2006; Youngblood, 2007). However, to achieve a successful outcome, a common goal, a shared vi-



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sion and an understanding of the disciplines' relationships to each other must exist (Laroui & van der Zwaan, 2002).

An interdisciplinary approach is not possible until individual discipline boundaries are transcended and each discipline learns to appreciate the different approaches and perspectives of other disciplines. This

requires respect for other disciplines, open-mindedness, trust and confidence in the other disciplines to approach the common problem and goal.

When people with different knowledge, skills and abilities are involved in solving problems, a greater range of perspectives exists that permits multiple interpretations of information and fosters new ideas (Fay, Borrill, Amir, et al., 2006). In turn, this affects innovativeness of problem solving and quality of decision making (Fay, et al., 2006). As a result, the interdisciplinary process establishes a new level of discourse and integration of knowledge.

Interdisciplinarity in OSH

The safety management field is complex. By definition it is an interdisciplinary field requiring a breadth of knowledge, skills and abilities. Complex challenges such as safety management have many facets and generally do not have just one answer or solution to a problem. Often, such complexity can only be understood through the perspectives of various disciplines. Therefore, OSH practitioners who seek solutions to problems often need the expertise of other disciplines. This is accomplished by collaboration, gaining new knowledge and openness to other perspectives.

The practice of safety tends to be primarily oriented to the physical rather than the social sciences. There is a difference between the hard (e.g., engineering, mathematics) and soft (e.g., psychology, sociology) sciences. Today, it is imperative that sharing occur between these two groups. If we dismiss the logic of the other, their contributions will be rejected when, in fact, those contributions can be critical to problem resolution (Schuftan, 1988). Therefore, building bridges between disciplines should be encouraged. This integration of disciplines forces OSH professionals to think more deeply about root causes and is supported by the literature search and conclusions derived from the original study of the effect of corporate culture on safety performance (Erickson, 1994, 2008).

By looking at the dynamics of whole systems, holistic schemes can be developed that subordi-

nate separate disciplines, thereby leading to new perspectives (Choi & Pak, 2006; Schuftan, 1988). The concept of systems is not foreign to safety professionals who frequently use systematic approaches to investigate adverse events. Therefore, it appears logical to use systems thinking when considering the relationship between safety and the organization.

For companies to achieve high safety and organizational performance, both OSH and business managers need more awareness and understanding of what the social sciences can contribute to their efficiency and effectiveness.

Barriers to Interdisciplinarity

Each discipline operates under significantly different assumptions, thereby interpreting problems based on these assumptions (Kabore, Nettle & Paine, 2008). For example, people in natural science disciplines associated with quantification, such as engineering, may believe they are more scientifically rigorous than those in the softer fields, such as psychology. Conversely, those in the social sciences, such as psychology, may interpret the more quantitative or harder disciplines as not being holistic in their perspectives and, therefore, not able to grasp broader perspectives of situations or problems. In essence, the two types of disciplines seem to practice their professions in different worlds (Schuftan, 1988).

Being trained or educated in a given or traditional discipline tends to limit approaches and perspectives. If people limit themselves to the boundaries of their own disciplines, they may miss opportunities to progress and to benefit from what other disciplines offer (Choi & Pak, 2006). They may have emotional investments in their belief systems and may reject what others have to say if they believe their logic is different (Schuftan, 1988). According to Kuhn (1970), research results that are not applicable to the prevailing way of thinking are often ignored, dismissed or explained away. In essence, these individuals may be limited by their own mental frameworks if they are not open to learning about alternative world views (Kabore, et al., 2008).

People generally want to maintain the status quo and usually will not publicly challenge it. They experience a comfort level in remaining within one's familiar discipline and with the known, tending to stick with those who are like-minded. As Dörner (1997) states:

The tendency of a group of experts to reinforce one another's conviction that they are doing everything right, the tendency to let pressure to conform suppress self-criticism within the group . . . is what Irving Janis identified as the great danger of "groupthink." (pp. 33-34)

Old ways die hard and new ways are hard to see. However, this can lead to blind spots, which are often an impediment to a more comprehensive understanding of events (Kabore, et al., 2008).

In the late 19th century, as various professions were coming into existence after the Civil War,

American universities separated the humanistic and natural disciplinary perspectives (Geisler, 2002). Because of the complexity of many problems and the obvious need for integration, attempts to resolve this divide are underway.

The OSH field needs both the hard and soft sciences to solve questions and problems that are amenable to interdisciplinary interventions. By ignoring apparently nonsafety-specific research that directly affects the safety field, OSH professionals will continue to approach safety in a limited manner. They must be able and willing to cross disciplines to achieve what is clearly a common goal (Kabore, et al., 2008).

Overcoming Barriers

People can change how they think; they can escape old ways of thinking and adopt a more critical approach to their world view (Browne & Keeley, 2003). By thinking and acting critically and by asking substantive questions about the status quo, people can expand their understanding (Schuftan, 1988).

Rethinking long-held opinions and traditions in the face of indisputable facts is necessary to help people problem solve and attain goals. When scientific research evidence is available, the old models generally fall behind. However, this is not always the case.

For example, spontaneous generation (the belief that some organisms arose spontaneously from nonliving matter) continued for centuries, from the time of the ancient Romans through the Middle Ages. It was not until 1859 that Louis Pasteur, the French chemist, scientifically demonstrated that spontaneous generation was false, and that microorganisms exist throughout the environment to readily contaminate rotting organic matter.

Conversely, the Flat Earth Society, founded in the early 1800s, continues to exist despite overwhelming scientific evidence to the contrary.

Where does safety fall on this spectrum? Does it accept and incorporate new findings related to safety performance or does it rely on outmoded beliefs and techniques?

Technology/Knowledge Transfer

Technology or knowledge transfer is the process of bringing new technologies or ideas from research into daily practice. In the postindustrial society, knowledge is a dominant feature. The primary purpose of learning is to integrate new knowledge into the way people work.

It is essential that knowledge be linked to activity, such as safety management, because that is the only way it can be successful and transform reality (Schuftan, 1988). Since successful knowledge transfer has been demonstrated as leading to higher productivity and performance (Argote, Ingram, Levine, et al., 2000), this is directly relevant to OSH professionals.

Knowledge transfer is not only about the tangible, but also, and more importantly, about people and their working environments (Shaw, 2001). In keeping with the push for evidence-based inter-

ventions, OSH professionals have much to gain through awareness of applicable social research that can help them become more efficient and effective. Some directly relevant areas include group dynamics, motivation, corporate culture and psychosocial factors.

Group Dynamics

Work groups are an integral part of larger organizations. Many aspects of groups are beyond the scope of this article. However, studies have demonstrated that within groups with differing opinions, interdisciplinarity creates better decision making (Paletz & Schunn, 2010).

When new ideas are not introduced, new perspectives are not developed and innovations are not considered. Groups can also carry the inherent danger of everyone thinking fairly alike. Groupthink is a common phenomenon whereby people in groups tend to conform and reach consensus, overriding alternative views (Janis, 1972). This creates the illusion of unanimity because people with differing views or doubts avoid voicing them. As a result, questioning, which is a necessary component for innovation and continuous improvement, does not occur.

Motivation

Motivation is the willingness to exert high levels of effort toward a goal. This effort is conditioned to satisfying individual needs that help make certain outcomes appear positive. For the employee, this could be interpreted as working safely to avoid injuries, a goal shared by OSH professionals and their companies.

Among the many that exist, two motivation theories and their modifications are currently practiced and seem particularly relevant to OSH management and employee safety.

According to Theory X and Theory Y, proposed by McGregor (1960), managers' assumptions about employees are either negative (Theory X) or positive (Theory Y). McGregor concluded that employee motivation was higher with Theory Y. His theory contrasts employees viewed as a cost of doing business versus seeing them as a valuable resource. Research has demonstrated that an organization's assumptions about employees are significant determinants of safety performance (Erickson, 1994).

Herzberg (1959) proposed motivation-hygiene theory. He suggested emphasizing organizational characteristics such as personal recognition and achievement as motivators since people find them intrinsically rewarding. Intrinsic rewards are intangible values or pleasures that usually arise from within the person. Extrinsic rewards are tangible benefits usually originating from outside the person. Intrinsic motivation has been demonstrated as a statistically significant factor in safety performance level (Erickson, 1994).

Integrating economics and psychology, Pink (2011) emphasizes the importance of intrinsic motivation. He contends that the organizational environment that encourages creativity and innovative thinking motivates employees to succeed, flourish

and become more productive, thereby becoming more valuable to the company.

Corporate Culture

Studying the effect of corporate culture on safety performance is an interdisciplinary effort, establishing connections among the previously unintegrated disciplines of OSH management, corporate culture and organizational behavior (Erickson, 1994). The research demonstrated that the most predictive factor of safety performance level is the way employees are treated, or psychosocial factors.

An example of the interdisciplinarity of corporate culture is expressed in Figure 1, whereby the intersection of three areas represents where assessment and evaluation of the corporate culture occurs.

Psychosocial Factors

Psychosocial factors involve the organization of work, workplace stress and the way people are treated in the organization.

Soft Skills

Soft skills, also known as people skills, are involved with the way people are treated in the workplace. Soft skills are distinct from hard skills, which apply a technical skill set to perform specific tasks that are typically measurable and quantifiable.

Examples of soft skills include personality traits or attributes that characterize one's relationships with others. They include respect for and trust of others, diplomacy and tact, and the ability to read situations to ensure the best outcome for all involved.

Relationship building is an important soft skill. The foundation for this skill includes authentic-

ity, helpfulness and genuine interest in employee problems. Since people generally respond to others in the way they are treated, it follows that when people are treated favorably they will tend to respond in kind.

Empathy is the ability to put oneself in another's situation and feel what s/he is feeling. One can develop empathy by listening more and talking less. Even a short conversation can create a great deal of insight into what is going on with the employee and the organization.

Communication that is straightforward, open and honest can lead to more open and trusting relationships. Successful communication also depends on knowing when to speak or to listen.

When discussing soft skills, two factors must be considered:

- 1) Soft skills are interrelated.
- 2) Soft skills can be learned but cannot be taught.

Psychosocial factors, which are manifestations of corporate culture, directly affect employees' emotions and thoughts, and have a direct, relevant role in the level of safety performance.

Extensive literature exists on the direct and indirect negative effects of psychosocial factors on safety and organizational performance. A few examples follow.

Safety

- Increased injuries (CCOHS, 2016; Erickson, 1994; Harter, Schmidt, Agrawal, et al., 2013; Johannessen, Gravseth & Sterud, 2015; Lu, Nakata, Park, et al., 2013; Michael, 2001; Niedhammer, Chastang & David, 2008; Smith & Dejoy, 2012).

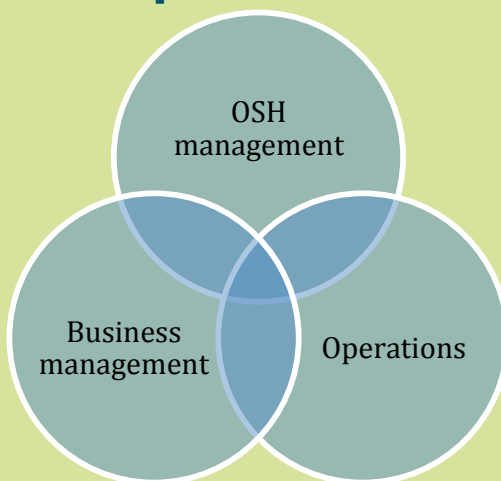
Employee Health

- Musculoskeletal disorders (Burton, 2008; CCOHS, 2016; Kaila-Kangas, Kivimäki, Riihimäki, et al., 2004; Michael, 2001);
- Low morale (CCOHS, 2016; Erickson, 1994);
- Depressive symptoms or major depressive episodes (Bonde, 2008; Burton, 2006; NIOSH, 2015; Paterniti, Niedhammer, Lang, et al., 2002; Rayens & Reed, 2013; Wulsin, Alterman & Bushnell, 2014);
- Illness (CCOHS, 2016; Michael, 2001; Sauter, Hurrell, Murphy, et al., 1998);
- Cardiovascular disease (Burton, 2006; Luckhaupt & Calvert, 2014; Michael, 2001; Niedhammer, et al., 2008);
- Anxiety disorders (Burton, 2006; CCOHS, 2016; de Croon, Blonk, de Zwart, et al., 2002; Murcia, Chastang, & Niedhammer, 2013; Paterniti, et al., 2002).

Other Workplace Aspects

- Lack of employee involvement (Aumann & Galinsky, 2009; CCOHS, 2016; Erickson, 1994);
- Lost productivity (CCOHS, 2016; Harter, et al., 2013; Karlsson, Björklund & Jensen, 2010; Sauter, et al., 1998);
- Reduced efficiency/performance (CCOHS, 2016);
- Job dissatisfaction (Aumann & Galinsky, 2009; CCOHS, 2016; de Croon, et al., 2002; Michael, 2001);
- Lack of motivation (CCOHS, 2016).

Figure 1
Interdisciplinarity
of Corporate Culture



Note. Adapted from "The Effect of Corporate Culture on Injury and Illness Rates Within the Organization," by J.A. Erickson, 1994, Dissertation Abstracts International, 55(6).

Adopting New Ways of Looking at the World

OSH professionals generally rely on cognitive (or hard) science, such as engineering, mathematics and biology, to provide a safe and healthy working environment. With a growing body of evidence-based research in the field of management systems, and particularly corporate culture with its psychosocial factors and their emphases on the soft sciences such as social and organizational psychology, mechanisms and/or protocols are needed to integrate these findings into the way OSH professionals perform their responsibilities.

In general, a divide and subsequent lack of integration tend to exist between the cognitive and social sciences (Kabore, et al., 2008). OSH professionals can overcome this lack of integration by becoming aware of and open to the contributions of both cognitive and social sciences. This will result in an interdisciplinary perspective of the work situation, thereby giving OSH professionals a greater understanding and ability to derive alternative solutions. By integrating the knowledge bases of various domains of expertise, innovation and subsequent implementation can be achieved (Kabore, et al., 2008) with the goal of increasing safety performance.

In addition to individuals' awareness and implementation of nonsafety disciplines' contributions to safer and healthier work environments, professional safety organizations, accreditation bodies of academic safety programs, professional organizations' certification programs and regulatory agencies also have a role to play. Professional safety organizations are in an ideal position to inform their members of evidence-based developments in other disciplines and integrated work that have a direct effect on safety performance. This can be accomplished through presentations at annual conferences, continuing education courses and publication of journal articles.

An example of an integrated discipline article combining safety management and social science was published in *Professional Safety* (Rebbitt & Erickson, 2016). Accreditation of academic safety programs could include mandatory coursework related to social psychology and organizational behavior. Regulatory agencies can integrate evidence-based knowledge into their promulgation of regulations and issuance of standards. An example of such a standard is CAN/CSA-Z1003-13/BNQ 9700-803/2013, Psychological Health and Safety in the Workplace—Prevention, Promotion and Guidance to Staged Implementation, issued by Canada in 2013 (CSA Group, 2013).

Organizational skills consist of three factors: technological, interpersonal and sociotechnical. These skill sets must be integrated to allow for acceptance of new ideas (Shaw, 2001). Traditionally, OSH professionals have dealt primarily with the technological aspects. However, the best solutions are achieved when they account for people and their personal environments, not solely their physical environments.

Corporate culture is sometimes defined as, "the way we do things around here." This statement implies a set of values: What and how things are done, the preferences of certain belief systems over others and the parameters of acceptable behavior. Human issues can ultimately make or break a system (Schuftan, 1988) and, therefore, need more emphasis and understanding by

the OSH profession and business communities. To shape the desired outcomes of working safely, organizations need to create the values that will do so. **PS**

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References

- Argote, L., Ingram, P., Levine, J.M., et al. (2000). Knowledge transfer in organizations: Learning from the experience of others. *Organizational Behavior and Human Decision Processes*, 82(1), 1-8. doi:10.1006/obhd.2000.2883
- Aumann, K. & Galinsky, E. (2009). The state of health in the American workforce: Does having an effective workplace matter? (Sept. 2011 Rev.). Retrieved from <http://familiesandwork.org/site/research/reports/HealthReport.pdf>
- Bonde, J.P. (2008). Psychosocial factors at work and risk of depression: A systematic review of the epidemiological evidence. *Occupational and Environmental Medicine*, 65(7), 438-445. doi:10.1136/oem.2007.038430
- Browne, M.N. & Keeley, S.M. (2003). *Asking the right questions: A guide to critical thinking* (7th ed.). Upper Saddle River, NJ: Prentice Hall.
- Burton, J. (2006). Creating healthy workplaces. Retrieved from www.iapa.ca/pdf/2004_HWP_Healthy_Workplace_FINAL.pdf
- Canadian Center for Occupational Health and Safety (CCOHS). (2016). Workplace stress—General. Retrieved from www.ccohs.ca/oshanswers/psychosocial/stress.html
- Canadian Standards Association (CSA) Group. (2013). Psychological health and safety in the workplace—Prevention, promotion and guidance to staged implementation (CAN/CSA-Z1003-13/BNQ 9700-803/2013). Retrieved from www.csagroup.org/documents/codes-and-standards/publications/CAN_CSA-Z1003-13_BNQ_9700-803_2013_EN.pdf
- Choi, B.C.K. & Pak, A.W.P. (2006). Multidisciplinarity, interdisciplinarity and transdisciplinarity in health research, services, education and policy: 1. Definitions, objectives and evidence of effectiveness. *Clinical and Medical Investigations*, 29(6), 351-364.
- de Croon, E.M., Blonk, R.W.B., de Zwart, B.C.H., et al. (2002). Job stress, fatigue and job dissatisfaction in Dutch lorry drivers: Towards an occupation-specific model of job demands and control. *Occupational and Environmental Medicine*, 59(6), 356-361. doi:10.1136/oem.59.6.356

- Dekker, S. (2012). *Just culture: Balancing safety and accountability* (2nd ed.). Farnham, England: Ashgate.
- Dekker, S. (2014). *Safety differently: Human factors for a new era* (2nd ed.). Boca Raton, FL: CRC Press.
- Deming, W.E. (2000). *Out of the crisis*. Cambridge, MA: MIT Press.
- Dörner, D. (1997). *The logic of failure: Recognizing and avoiding error in complex situations* (R. Kimber & R. Kimber, Trans.). New York, NY: Basic Books.
- Erickson, J.A. (1994). The effect of corporate culture on injury and illness rates within the organization. *Dissertation Abstracts International*, 55(6).
- Erickson, J.A. (2008, Nov.). Corporate culture: Examining its effects on safety performance. *Professional Safety*, 53(11), 35-38.
- Fay, D., Borrill, C., Amir, Z., et al. (2006). Getting the most out of multidisciplinary teams: A multisample study of team innovation in healthcare. *Journal of Occupational and Organizational Psychology*, 79(4), 553-567. doi:10.1348/096317905x72128
- Geisler, C. (2002, Dec. 12). Multidisciplinary: The renewal of the university and its curriculum. Lecture presented at NEH Seminar: Dialogues between two cultures, University of Colorado at Boulder.
- Harter, J.K., Schmidt, F.L., Agrawal, S., et al. (2013, Feb.). The relationship between engagement at work and organizational outcomes. Washington, DC: Gallup. Retrieved from <http://employeeengagement.com/wp-content/uploads/2013/04/2012-Q12-Meta-Analysis-Research-Paper.pdf>
- Herzberg, F. (1959). *The motivation to work*. New York, NY: Wiley.
- Hollnagel, E. (2014). *Safety-I and safety-II: The past and future of safety management*. Farnham, England: Ashgate.
- Janis, I.L. (1972). *Victims of groupthink: A psychological study of foreign-policy decisions and fiascoes*. Boston, MA: Houghton Mifflin.
- Johannessen, H.A., Gravseth, H.M. & Sterud, T. (2015). Psychosocial factors at work and occupational injuries: A prospective study of the general working population in Norway. *American Journal of Industrial Medicine*, 58(5), 561-567. doi:10.1002/ajim.22431
- Kabore, C., Nettle, R. & Paine, M. (2008). Multidisciplinary knowledge partnerships and research teams for dairy innovation: Experiences in the FutureDairy project (Australia). 8th European IFSA Symposium, July 6-10. Clermont-Ferrand, France.
- Kaila-Kangas, L., Kivimäki, M., Riihimäki, H., et al. (2004). Psychosocial factors at work as predictors of hospitalization for back disorders. *Spine*, 29(16), 1823-1830. doi:10.1097/01.brs.0000134572.46151.0a
- Karlsson, M.L., Björklund, C. & Jensen, I. (2010). The effects of psychosocial work factors on production loss and the mediating effect of employee health. *Journal of Occupational and Environmental Medicine*, 52(3), 310-317. doi:10.1097/jom.0b013e3181d1cda2
- Kuhn, T.S. (1970). *The structure of scientific revolutions*. Chicago, IL: University of Chicago Press.
- Laroui, F. & van der Zwaan, B.V. (2002). Environment and multidisciplinary: Three examples of avoidable confusion. *Integrated Assessment*, 3(4), 360-369. doi:10.1076/iaij.3.4.360.13589
- Lu, M., Nakata, A., Park, J.B., et al. (2013). Workplace psychosocial factors associated with work-related injury absence: A study from a nationally representative sample of Korean workers. *International Journal of Behavioral Medicine*, 21(1), 42-52. doi:10.1007/s12529-013-9325-y
- Luckhaupt, S. & Calvert, G. (2014, Aug. 1). Prevalence of coronary heart disease or stroke among workers aged < 55 years—United States, 2008-2012. *Morbidity and Mortality Weekly Report*, 63(30), 645-649.
- McGregor, D. (1960). *The human side of enterprise*. New York, NY: McGraw-Hill.
- Michael, R. (2001, May 18). Physical, psychosocial and work organization factors on injury/illness absences. *Ergonomics Today*. Retrieved from <https://ergoweb.com/physical-psychosocial-and-work-organization-factors-on-injuryillness-absences>
- Murcia, M., Chastang, J. & Niedhammer, I. (2013). Psychosocial work factors, major depressive and generalized anxiety disorders: Results from the French national SIP study. *Journal of Affective Disorders*, 146(3), 319-327. doi:10.1016/j.jad.2012.09.014
- Niedhammer, I., Chastang, J. & David, S. (2008). Importance of psychosocial work factors on general health outcomes in the national French SUMER survey. *Occupational Medicine*, 58(1), 15-24. doi:10.1093/occmed/kqm115
- NIOSH. (2015). Total worker health: Why do I need an integrated approach to safety and health? Retrieved from www.cdc.gov/niosh/TWH
- Paletz, S.B. & Schunn, C.D. (2010). A social-cognitive framework of multidisciplinary team innovation. *Topics in Cognitive Science*, 2(1), 73-95. doi:10.1111/j.1756-8765.2009.01029.x
- Paterniti, S., Niedhammer, I., Lang, T., et al. (2002, Aug.). Psychosocial factors at work, personality traits and depressive symptoms: Longitudinal results from the GAZEL Study. *The British Journal of Psychiatry*, 181(2), 111-117. doi:10.1192/bjp.181.2.111
- Petersen, D. (2001). *Safety management: A human approach*. Des Plaines, IL: ASSE.
- Pink, D.H. (2011). *Drive: The surprising truth about what motivates us*. New York, NY: Riverhead Books.
- Rayens, M.K. & Reed, D.B. (2013). Predictors of depressive symptoms in older rural couples: The impact of work, stress and health. *Journal of Rural Health*, 30(1), 59-68. doi:10.1111/jrh.12028
- Rebbitt, D. & Erickson, J. (2016, July). Hypercompliance: Too much of a good thing? *Professional Safety*, 61(7), 31-37.
- Sauter, S., Hurrell, J.J. Jr., Murphy, L.R., et al. (1998). Chapter 34: Psychological and organizational factors. *Encyclopaedia of Occupational Health and Safety* (4th ed.). Retrieved from www.ilocis.org/documents/chpt34e.htm
- Schuftan, C. (1988). Multidisciplinary, paradigms and ideology in development work. *Scandinavian Journal of Development, Alternatives* 7(2-3).
- Shaw, M.S. (2001, March). Integrating learning technologies: The sociocultural, pragmatic and technology design contexts. *Teaching and Learning With Technology*, No. 6. Retrieved from www.shawmultimedia.com/integrate.html
- Smith, T.D. & Dejoy, D.M. (2012). Occupational injury in America: An analysis of risk factors using data from the General Social Survey (GSS). *Journal of Safety Research*, 43(1), 67-74. doi:10.1016/j.jsr.2011.12.002
- Whittingham, R.B. (2004). *The blame machine: Why human error causes accidents*. Burlington, MA: Elsevier Butterworth-Heinemann.
- Woods, D., Dekker, S., Cook, R., et al. (2010). *Behind human error* (2nd ed.). Farnham, England: Ashgate.
- Wulsin, L., Alterman T. & Bushnell, T. (2014). Prevalence rates for depression by industry: A claims database analysis. *Social Psychiatry and Psychiatric Epidemiology*, 49(11), 1805-1821.
- Youngblood, D. (2007). Interdisciplinary studies and the bridging of disciplines: A matter of process. *Journal of Research Practice*, 3(2) Article M18.