

# Psychology, Risk & Safety

*Understanding how personality  
& perception can influence risk taking*

**By Dominic Cooper**

**S**H&E PROFESSIONALS STRIVE to eliminate risks in the workplace so that accidents do not occur. Risk refers to "the possibility of harm or loss" presented by the existence of perceived threats within a particular situation. However, people's perceptions of risk are determined by many factors, including their personalities, and behavioral, attitudinal and situational biases. Because each person is unique, s/he does not necessarily perceive the same risk in exactly the same way as others.

Personality characteristics have been clearly linked to job performance in various arenas, but the link between risk and personality in the workplace is not well-documented. The available research suggests that a person's disposition or personality and the risk situation at hand influences risk perception, risk appraisal, the propensity to take risks and actual risk-taking behavior. Other research indicates that a person's peer or reference group exerts a large influence on that person's attitudes toward risk and how s/he perceives workplace risks. The quality of the group's leadership also influences group norms, which in turn affects people's risk perceptions and their risk-taking behavior.

Recognizing these factors can enhance people's risk perceptions and reduce risk-taking behavior. However, given that personality and other individual factors are not in the employer's control, it makes sense to develop a formal risk control system to minimize workplace risks. This entails 1) developing risk control policies; 2) ensuring that risks are identified and assessed; 3) implementing appropriate risk control methods; 4) documenting risk control measures; and 5) monitoring the effectiveness of those measures.

### **The Role of Perception**

Perception is a key component of human behavior. It is the mechanism with which a person evalu-

ates inputs from the external environment, which, in turn, determines his/her behavioral response. In conjunction with personality or disposition, attitudes and previous experiences, perceptions comprise a person's unique appraisal of the environment. These perceptions are critical antecedents that precede behavior as they form a vital part of the human survival instinct.

For example, when a person senses danger, s/he either faces it (fight) or avoids it (flight) (Glendon and McKenna 2007). Some perceive danger in nearly every situation, while others rarely see it (Keyes). As a result of these differences, some people have a greater propensity to take risks while others have a greater propensity to avoid risks (Bromiley and Curley). A person's risk-taking propensity is determined by his/her perception of the situation, past experience in similar situations and his/her personality. Often, workplace attempts to minimize risk-taking behavior fail to account for these individual differences and the personality of the risk taker(s). In particular, how such factors might affect people's risk perceptions, appraisals and their risk-taking propensity is often ignored within the safety literature. The underlying assumption is that all people see and evaluate risks in the same way, which is simply not true [Cooper(a)].

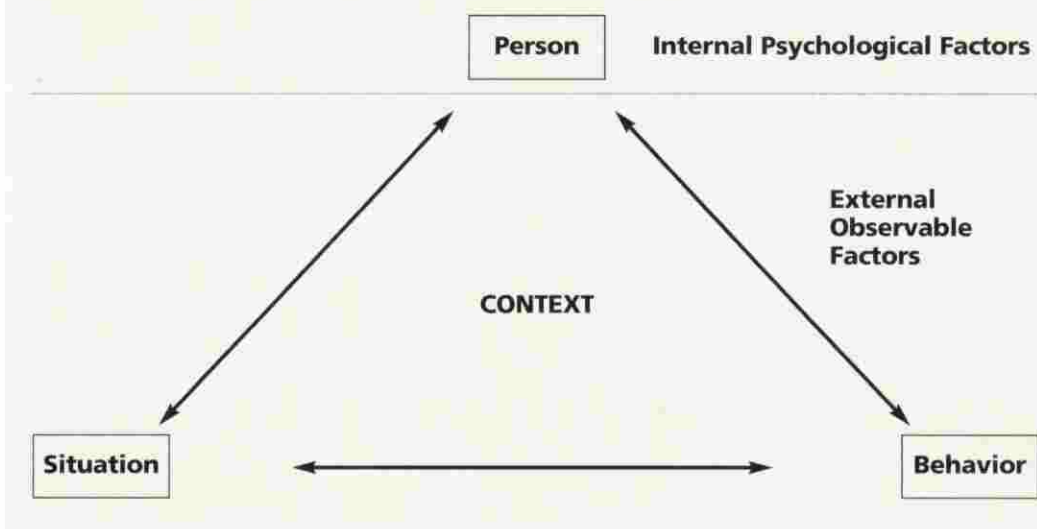
### **The Concept of Risk**

As noted, risk is essentially a subjective construct that refers to the possibility of harm or loss within a particular situation (e.g., working on energized equipment). Thus, risk perception first requires someone to identify the existence of a possible threat, which does not always occur. For example, a threat may not have been recognized previously in a similar situation. This is illustrated by accident

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**Figure 1**

## Reciprocal Model of Risk Perception



### Individual Differences

Research has shown that people's perceptions of risk are influenced by an interactive combination of situational, attitudinal and behavioral biasing factors (Figure 1). Situational factors exert powerful influences on people's behavior (Luthans and Martinko), to the extent that changes in job design which incorporate skill variety, task identity, task significance, autonomy and feedback can significantly change both behavior and attitudes (Freid and Ferris). In the workplace, situational factors linked to risk perception include the manner in which information is communicated (Slovic, et al), the task environment, the task

triangles which suggest that in 330 cases, people can take risks (i.e., behave unsafely) about 300 times without being harmed (Heinrich, et al). Such reinforcement can lead people to ignore the dangers in behaving unsafely (Geller 42).

Lack of harm from such risk taking may also foster an illusion of control, whereby people believe they can control the uncontrollable, particularly when the illusion of control is based on a person's skill set (Langer). It is thought that illusion of control has some basis in personality (Flammer, et al). In other cases, people do not realize that a genuine threat exists simply because they are unaware of the danger. Others may acknowledge the risk but relish the challenge to their skills and abilities. For them, perceived risk could be a source of stimulation (Glendon and McKenna).

Overconfident people often minimize the threat posed by a risk as well (Nicholson, et al). Supporting evidence reveals that when people indicate they are 100-percent confident of achieving something, their assumptions are correct only 70 to 80 percent of the time (Fischhoff). In the safety domain, this could mean that an overconfident worker underestimates the risks involved in his/her job 20 to 30 percent of the time; this may provide clues about how some of those "inexplicable accidents" happen—incidents that are often attributed to a person's "poor safety attitude."

Once a situation, condition or event is perceived to be potentially harmful, a person may conduct a risk assessment. S/he may ask, "What is the probability of the threat being realized?" "If it is realized, how severe will the consequences be?" If the probability is perceived to be low or the likely severity to be minimal, the person may continue as before. Conversely, if the probability or severity is perceived to be high, s/he will likely change behavior or get out of the situation.

itself, the way the organization is structured, the organization's strategic goals and the prevailing organizational culture. Safety culture research has shown the major organizational factors that influence people's perceptions of work-related risks include staffing levels; employer response to breaches of standard operating procedures; the organization's emergency preparedness; the status of SH&E personnel; management's perceived commitment to safety; and management's actions in relation to safety [Cooper(a)].

Attitudinal biases include people's disposition or personality (Nicholson, et al); the amount of control people feel they can exert on events (Rantanen); the ease with which they can recall or imagine past risky situations and events (Slovic, et al); and their motivations. In addition, group characteristics, such as the reference group (e.g., safety personnel, managers, employees) to which the person belongs, will affect his/her perceptions of risk (Harding and Eiser). People socialize into their workgroup and adopt the prevailing view of what is (and is not) risky. Group membership demands conformity to its values, beliefs and behaviors; deviations can bring social disapproval and other sanctions, which might ultimately lead to rejection. Specific attitudinal biasing factors that affect risk perception in safety include people's personal commitment to safety, their beliefs about the causes of accidents and how stressful they find their jobs [Cooper(a)].

Behavioral biases typically include an individual's on-the-job experience and his/her reinforcement history (Wilson); how alert s/he is to risks present in the environment; whether or not s/he receives feedback; and the presence of others. The speed with which people are required to work is a particular concern. The greater the required pace, the greater the risks involved in an activity are perceived to be [Cooper(a)].

## Personality Factors

Personality has been defined as those stable psychological characteristics "that permit a prediction of what a person will do in a given situation" [Cattell(b)] or as "a relatively enduring disposition to behave consistently across situations" [Cattell(a)]. Much research has distilled personality traits into five main dimensions: conscientiousness, extroversion, neuroticism, agreeableness and openness to experience (Barrick and Mount).

Conscientiousness refers to being careful, thorough, responsible, hardworking, organized, ambitious and determined. Extroversion refers to being sociable, assertive, gregarious, talkative and ambitious. Neuroticism refers to being anxious, depressed, angry, embarrassed, emotional, worried and insecure. Agreeableness refers to being courteous, flexible, trusting, good-natured, cooperative, forgiving, soft-hearted and tolerant. Openness to experience refers to being imaginative, cultured, curious, original, broad-minded, intelligent and artistically sensitive. A subset of the extroversion dimension—need for achievement (NACH)—is important to risk-taking behavior.

## Personality & Job Performance

Conscientiousness has been linked to intelligence and job performance across all job types, likely due to its goal-setting aspects. Extroversion has been linked to job satisfaction and performance in sales and managerial jobs where sociability is important. Neuroticism has been linked with poor job satisfaction. These links indicate some genetic determination, which means that attempts to improve job satisfaction through job and work design may be of limited value.

Those with a high level of neuroticism also tend to show greater regularity of risk-taking across different situations and, not surprisingly, tend to experience more accidents. Openness to experience is linked to the ability and motivation to learn and can, therefore, be used to identify those most likely to benefit from training programs. Agreeableness does not appear to be a predictor of job performance, particularly in jobs that require a great deal of autonomy. Conversely, both conscientiousness and extroversion exert a greater influence on performance when the job-holder has a high degree of autonomy (Cooper, et al; Glendon and McKenna). NACH has also been linked

to entrepreneurial success and managerial success via a preference for challenging tasks (Atkinson). It is also described as encompassing:

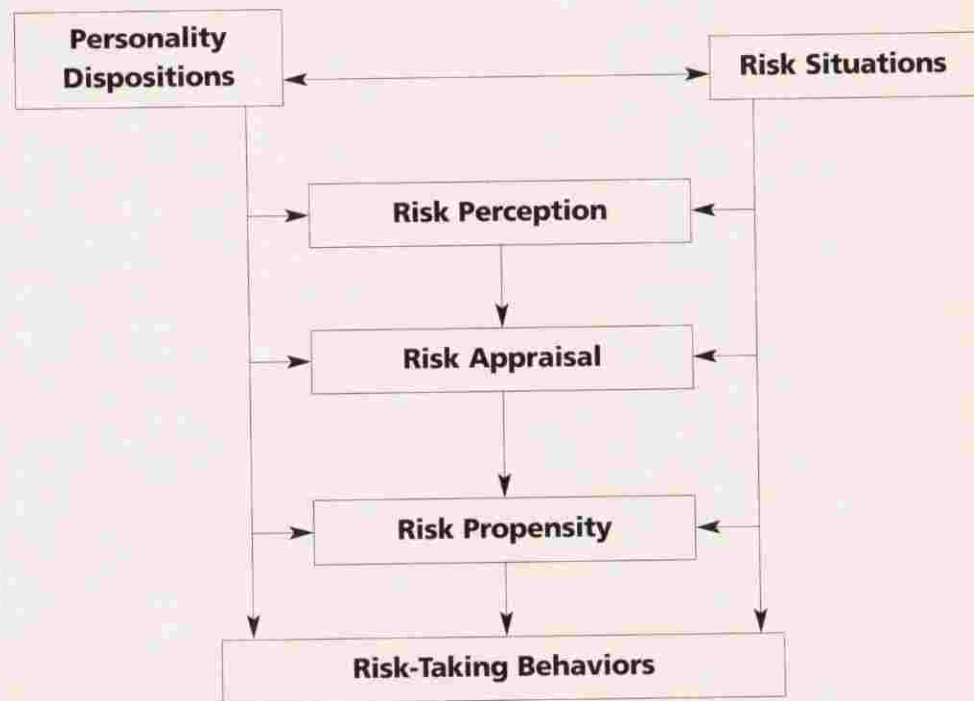
- Work ethic: Performance per se is good.
- Pursuit of excellence: Desire to perform to the best of one's abilities.
- Status aspirations: Desire to climb the status hierarchy and to dominate others.
- Competitiveness: Desire to compete with and beat others.
- Acquisitiveness: Of money and wealth.
- Mastery: Achieve competence against established standards (Cassidy and Lynn).

## Personality & Risk

Although NACH has clearly been linked to risk-taking behavior in different arenas, the link between personality characteristics and risk-taking behavior in the workplace is not particularly well-documented. The opposite of NACH is the need to avoid failure (NAVF), another psychological attribute related to risk-taking behavior. People with high NAVF are risk-averse and strongly desire security.

The empirical evidence related to these two need motivations indicates that the appeal of risk-taking behavior depends on a person's disposition toward achieving success (NACH) or avoiding failure (NAVF) (Atkinson). Those with higher NACH prefer intermediate levels of risk taking, particularly when using

**Figure 2**  
**Process View of Risk**



Source: Adapted from Nicholson, et al.

their skills and abilities. They desire challenging tasks where success is possible, but not necessarily probable. Conversely, those with a higher NAvf prefer either high or low risks, where success or failure is guaranteed. In other words, these people want assurances of success or failure so the onus for failure can be removed from them and placed firmly on external factors.

This latter aspect shows that the concept of "locus of control," another personality characteristic, is also important to risk taking. Part of Rotter's social learning theory of personality, locus of control represents a generalized expectancy about how the rewards and punishments in people's lives are determined. At one extreme are those who believe in their ability to control life's events, and assign success or failure solely to their internal skills, knowledge and abilities. At the other extreme are those who believe that life's events are the result of luck, chance or fate (external factors) [Rotter(a);(b)].

Keyes found that people with an internal locus of control tend to take greater risks than those with an external locus of control, yet do not perceive themselves as taking risks. "High risk takers are more intent on winning than losing. They focus on controlling the situation" (Keyes). Thus, people with an internal locus of control have a strong belief in their

ability to control a situation and also tend to take responsibility for their actions when things go wrong. Those with an external locus of control see situations or events as being out of their control, and view themselves as victims and blame others or the situation when things go wrong.

### Risk Propensity

Risk propensity is the likelihood that a person will take risks if s/he is predisposed toward doing so based on personality, the extent to which the prevailing situation is seen as threatening and the potential reward for taking a risk. A person's propensity to engage in risky behavior is increased if a risk has not previously caused harm when engaged in a given type of behavior, and/or whether the potential rewards outweigh any negative outcomes.

Risk propensity is also determined by those with whom a person interacts, as coworkers' expectations exert strong influences on the way a person acts. Thus, while individual attitudes and personalities can be important in determining behavior, the power of group norms on risk-taking behavior can also be significant (Yates).

People relate to group norms in three stages: compliance, identification and internalization. When joining a group, people comply with group norms to

**Figure 3**

## Simple Risk Assessment Matrix

Activity = Placing body underneath unsupported gate while loading bottling machine

		Likelihood					
		1 per Decade = 1	1 per Year = 1	1 per Month = 2	1 per Week = 2	1 per Day = 3	More than 1 per Day = 3
E F F E C T	Disaster = 3						
	Very Serious Concern = 3			Unacceptable and must be controlled			9
	Serious Concern = 2						
	Moderate Concern = 2	Likely to be acceptable					
	Low Concern = 1						
	Trivial = 1						
			Risk Grading				

Potential effect = broken spine

avoid social sanctions from the group. As time passes, they identify with the rest of the group and do similar things because they want to be seen as a member of that group. Eventually, people internalize the group norms and naturally consider them to be the best way to think and behave.

The practical implications of this research for safety are enormous. For example, if a group considers risk-taking behavior to be the norm, all newcomers will soon comply with, identify with and internalize this type of behavior. Each member of the workgroup is then a "hair trigger" waiting to be pulled to realize the risk—perhaps for the rest of his/her working life. Conversely, if risk reduction is the norm, then newcomers will soon comply, identify and internalize it, resulting in much less risk to themselves and others. This suggests that new hires should be placed with the safest workgroups until they have internalized risk-averse group norms. It must also be recognized that team leaders and line managers help to create and maintain group norms. Thus, these leaders must set the right example.

#### Risk Mitigation

The process model of risk in Figure 2 shows that personality dispositions and the risk situation itself interact to influence risk perception, risk appraisal, risk propensity and actual risk-taking behavior. Since it is not possible to control people's personalities, this process model indicates that risk-taking

behavior can best be reduced by manipulating the situation to ensure the presence of appropriate risk control measures.

#### Organizational Risk Framework

The first step for developing a risk mitigation program is to delineate a risk framework that defines its boundaries within the organization. Risk typically arises from premises, plant and substances, procedures, people, planning and processes within each of a business unit's activity areas (HSE).

#### Risk Policies

Once the framework has been defined, the next step is to develop an overarching risk policy for the company as a whole, and more localized risk policies within each functional area, all of which align with the overarching policy (HSE). According to 1997 recommendations by the U.K. Health & Safety Executive (OSHA's counterpart), these policies should cover:

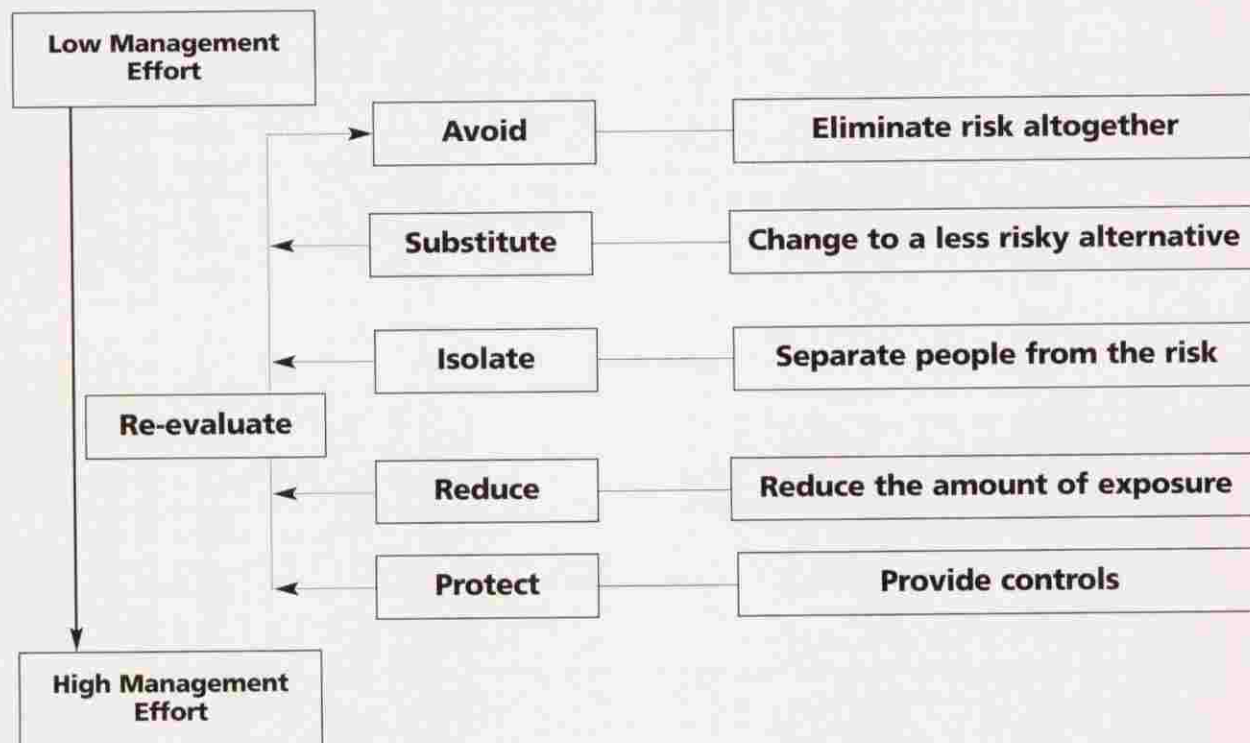
- roles, responsibilities and accountabilities for those charged with policy implementation;
- day-to-day control requirements;
- how risks will be analyzed;
- how risk controls will be measured/monitored;
- what feedback is required and when;
- how risk controls will be reviewed.

#### Identifying Risks

Once policies have been developed, risks in each activity area must be identified. This can be achieved

**Figure 4**

### Hierarchy of Risk Control Measures



**Figure 5**

## Remedial Action Impact Grid

		IMPACT	
		Low	High
DIFFICULTY	Easy to Do	<i>Example:</i> Provide induction/orientation training for all site visitors.  <i>Example:</i> Examine quality of line managers weekly safety inspections.	<i>Example:</i> Tie defect system to risk assessment system.  <i>Example:</i> Prioritize engineering items on safety grounds.
	Hard to Do	<i>Example:</i> Train project design team managers to safety advisor standards.	<i>Example:</i> Purchasing and supply to review impact of their policies on safety.

by systematically examining process flows and key control points within that sphere of operations [Cooper(b)]. Such an exercise should define each process in terms of each discrete activity within that process and the associated risks and expected loss types. Given that risk perception is culturally determined by a person's reference group, multidisciplinary or multihierarchy teams should be used so that a balanced approach is achieved. This also helps to induce commitment and ownership toward the development of a risk-aware culture.

### Risk Assessment Process

By keeping the process as simple as possible, all levels of personnel can undertake risk assessments in a consistent manner. Aspects to consider when assessing risk include:

- type of activity or work being performed;
- duration of the activity;
- who performs the work;
- technology, equipment and materials involved;
- overlaps with other functions, departments, business units, product lines, etc.;
- location and timing of the work;
- work procedures;
- number of people involved;
- potential for management system failures;
- potential for technical failures;
- potential for human error;
- consequences of failure in any area of the activity [Cooper(b)].

A strong case can also be made for examining the associated organizational policies or practices identified as being associated with the creation of risks (e.g., piecework payments), or those that reinforce identified risk-taking behaviors.

### Assessing Risks

Each risk identified must be evaluated, graded and ranked. When people discuss or assess risk, they often try to determine what constitutes "acceptable risk"—where the levels of loss or harm for risk taking are disproportionate to the potential rewards. The way people evaluate perceived risks is reflected in the components of the risk construct: 1) the likelihood of loss or harm; and 2) the severity or significance of effect. This breakdown of the risk construct provides a practical means to subjectively assess and quantify risks. Once the existence of perceived threats has been identified, severity and likelihood estimates can be used to produce a risk rating (i.e., severity x likelihood = risk rating). The frequency of occurrence of a risk event is also important; a risky activity that occurs frequently represents a greater likelihood of a risk being realized and causing harm or loss.

Figure 3 presents a simple matrix that incorporates all three risk constructs. For practical purposes, the likelihood and frequency constructs are combined. The matrix activity illustrated is people placing their bodies underneath an unsupported gate while loading a bottling machine. This occurs more than once per day. The potential risk or severity of effect is a spinal injury. The risk rating is achieved by multiplying the frequency/likelihood value (more than once per day = 3) by the effect value (serious concern = 3) to produce a risk score of 9, the highest possible in this matrix.

The matrix also reveals that risk events occur within two extremes: low frequency events with high impact; and high frequency events with low impact. A risk grading that falls into the upper half of the matrix is unacceptable and must be controlled.

Those falling into the lower half are likely to be acceptable and can be addressed once those in the upper half have been controlled.

#### **Prepare Risk Control Action Plans**

Having identified which risks require controls, those involved must determine which measures will reduce risk to an acceptable level. In principle, two strategies can be adopted: 1) reduce the likelihood of the event recurring; or 2) reduce the severity or effect of the risk. It is better if both strategies can be applied to a particular risk.

Choosing and implementing the most appropriate control will determine the success or failure of the risk reduction effort. The measure(s) put in place depend on the type of activity assessed and the thoroughness of that evaluation. Although risk controls must satisfy both organizational and job needs, control measures for any type of risk are basically the same. In essence, based on the principles of risk avoidance or risk reduction, a hierarchy of risk controls—avoid, substitute, isolate, reduce and protect (ASIRP)—should be employed (Figure 4). Following this hierarchy, initial efforts should focus on avoiding the risk. If this is not possible, efforts should then focus on combating the risk at its source by substitution, and so on. Where possible therefore:

- **Avoid.** Eliminate the risk.
- **Substitute.** Change the activity or process to one that is less risky.
- **Isolate.** Separate people from the processes to reduce risk.
- **Reduce.** Design a system that reduces risk to an acceptable level.
- **Protect** against risk. Guard or provide protective equipment; provide written procedural controls; ensure adequate supervision; identify training needs and provide training; provide instructions/information; and provide other controls such as auditing.

Whichever control measure is selected, it must be constantly monitored to see whether the risk (or aspects of it) can be eliminated. In many cases, a combination of control measures may be needed. It is feasible that any number of alternative measures would reduce the risk. In such instances, the hierarchy of controls should be used as a guide to decide which measure(s) to use.

Once a control measure has been proposed, another risk assessment must be performed to ensure that the original risk(s) will, indeed, be reduced or eliminated—and that no new risks will be introduced. If controls are unsatisfactory, another round of risk assessments is needed to identify better alternatives. This illustrates the iterative nature of the risk assessment process. It must be repeated until it is impossible to reduce risks any further. It should be noted that the amount of managerial/supervisory effort needed to establish and maintain the controls is in inverse rank order—that is, the amount of effort needed to manage for the protection against risk (e.g., wearing PPE) is much greater than that required to eliminate the risk.

#### **Ranking Risk Control Decisions**

Some control measures will be easy to implement and will have a high impact, while others will be difficult to implement and may not mitigate risk in any way. One way to ascertain this before selecting which control to implement is to use an impact grid (Figure 5). Any item that falls into the easy to do/high impact category would be completed first as this delivers some quick rewards. Items in the easy to do/low impact quadrant might remain undone unless a cumulative effect of implementing several items can be demonstrated. Similarly, any item in the hard to do/low impact quadrant must be assessed in cost/benefit terms. Cost/benefit analyses would also be needed for items in the hard to do/high impact quadrant. Often, however, remedial actions in this quadrant are most worthwhile although they take longer to implement and involve greater time and effort.

#### **Document Risks**

Each risk assessment should be documented so one can verify that all organizational activities have been assessed. The advantages of maintaining such records outweigh the perceived bureaucracy as they can be used in many ways. For example, these records:

- Demonstrate to board members, shareholders and regulatory agencies that the organization is identifying, assessing and controlling risks.
- Identify or reinforce the need for capital expenditure to be allocated to risk control.
- Reduce management's time during periodic reviews of risks.
- Identify training needs.
- Identify management system faults.

Risk assessment records must identify the control measures chosen and the reasons for choosing them. As such, the documents are focused primarily on the activities taking place, while taking into account any particular situational constraints, risks posed and the selected solutions. Such documentation should be readily accessible as well.

#### **Review & Revise**

Once control measures are implemented, they must be periodically reviewed (e.g., every 24 months) and updated so that any changes in circumstances can be accommodated (which also emphasizes the need to record each risk assessment). The timing of these reviews may also be dictated by circumstances such as:

*A person's risk-taking propensity is determined by his/her perception of the situation, past experience in similar situations and his/her personality. Attempts to minimize risk-taking behavior often fail to account for these individual differences.*

*The appeal of risk-taking behavior depends on a person's disposition toward achieving success or avoiding failure. Some prefer intermediate levels of risk taking. Others prefer either high or low risks, where success or failure is guaranteed.*

- occurrence of losses or errors;
- recommendations arising from internal audits;
- suggestions or complaints from employees, customers and others;
- introducing any new equipment, technology or materials;
- planning and introducing new work methods;
- introducing new legislation or amendments to existing legislation.

existing legislation.

Whatever remedial actions arise based on these reviews, those involved must strive to ensure that they are carried out. This is normally best achieved by allocating responsibility for doing so to a specific person who must complete the actions within a set timeframe. Additional checks are needed to ensure that the designated person completes the task.

#### **Risk Measurement**

Once controls have been implemented, their effectiveness must be assessed. This can be achieved by developing key performance indicators (KPIs) to monitor such aspects as the frequency of occurrence of each risk identified; timing of each risk occurrence; and severity of impact (in dollars). Most importantly, KPIs must be simple, easy to understand, easy to apply, easy to collect and predictive.

#### **Risk Reporting**

Senior management must have a clear image of risk potential. This requires a set of summary metrics which can be placed on one piece of paper and read at a glance. Whichever type of summary index is used, it is best to maintain the same format across all product areas and geographical locations; this ensures consistency and apples-to-apples comparisons.

#### **Conclusion**

People do not view risks in the same way. Their perceptions are affected by their personalities, their appraisal of the situation and their workgroup safety norms. The concept of risk is also complex, as it covers a multitude of factors. To overcome these complexities, a risk mitigation framework such as that presented can enable an organization to standardize its approach to risk management. ■

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