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The Essence of Safety—Do You Really Know Safety?

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This paper is a written expression of my mental model of safety, shaped and honed over nearly 30 years in the engineering, Safety and consulting professions, and motivated by a personal need to challenge prevailing perceptions and paradigms, stimulate thinking, dialog and the pace of change in safety management, and control of hazard-related incidents. How I "see" safety might well differ from your vision, and mine may suffer from one or more the drawbacks described below in he sidebar on Mental Models (Figure 1). In other words, "I could be wrong." Right, wrong, or somewhere in between, the premise begs to be tested, debated, and expectantly verified that:

A single-minded model or vision of what Safety is and how to manage it is not a certainty among professionals or among whom we serve. That uncertainty is a gap needing closure or at least bridging. It also represents an opportunity that might lead the Safety Professional and organizations to a higher level or capability, confidence and certainty in a quest to control hazard-related incidents.

In 1976, while at the National Academy of Science, Dr. William Lowrance voiced concern that the notion of Safety "has so far been poorly defined, widely misunderstood, and often misrepresented. He went on to state, "Much of the widespread confusion about the nature of Safety…would be dispelled if the meaning of the term *Safety* were clarified." We have come a long way in Safety over the past 30 years and are justifiably safer now than ever before in our recorded history. However, that "confusion" and misunderstanding persists surrounding Safety, how to define it and manage it, imposing a barrier to our ability to achieve the levels of Safety performance possible in this technologically advanced 21st century.

Developing a grounded, intimate and uniform understanding of Safety is, without question, at the very core of our professional essence, scope and responsibilities. So too, is our responsibility to communicate more effectively, educate more thoroughly and direct more confidently those we serve so that we, as a profession, and our respective organizations, can evolve as a system toward a single-minded vision of Safety and how to effectively manage it. Yet, when put to a test, something as basic as defining, "What Safety means to me," has profoundly different meanings among top management, supervision, hourly workers and safety professionals. This perceptual difference is more than a barrier, more than a gap. It may take on the proportions of a chasm in many companies. A message echoes loud an opportunity for Safety professionals to realign

individual and corporate mental models regarding Safety, and close that gap between what it is, and what so many others think it is.

Mental Models – At the Root

Variations in our perception of Safety stem, perhaps in large part, from our reliance on mental models. These are constructs of reality shaped over time by personal, cultural or professional experiences; influenced by what we learn and hear from others; fortified by tested or untested facts, and embellished by truths or myths, ultimately directing our belief structures, decisions, actions and behavior. Mental models, in theory, are internal pictures, 'small scale models' (Byrne; Dove), sketches or sets of core beliefs of reality that we apply as a means to understand ourselves, interactions with others, where or how we fit within the world around us, and how systems work. (Dove) They play a powerful central, unifying and predictive role in representing objects, states of being, sequences of events, cause and effect relationships, the social and psychological actions of daily life, and may form the basis for all reasoning processes. (Holland) Laurence Gonzalez, in *Deep Survival*, described mental models as one of two strategic "search engines" that the brain employs to handle new, unfamiliar or complicated situations or problems. The other search engine being "emotional bookmarks," those stored experiences of feelings that help direct logic and reason to a place where they can do useful work. These benchmarks may well be another form of mental model. So too could Safety, a "state of being," embodying an array of emotions, be a mental models.

Cognitive scientists believe that the human brain constructs mental models "on-the-fly" (Dove) from bits and pieces of knowledge derived from our or others' experiences, our imagination, perceptions and problem solving strategies. The building process might is akin to putting together a puzzle without pre-knowledge or certainty of the final picture, or perhaps how the pieces fit together. The puzzle picture takes shape as we add pieces, but it may never be complete. Though mental models help us negotiate within, or frame, our reality, they have drawbacks (Exhibit 1).

Culture, education and training condition us to think linearly, e.g. A leads to B and B to C. The real world, however is anything, but linear. Mental models and linear thinking do make our world easier to comprehend. Nevertheless, to grasp the true complexity of the natural world, business systems, accident causation and the complex, multi-factorial and often chaotic intermingling of immediate and root causes, psychosocial factors and cultural influences, not to mention the role chance plays, may well be beyond our mental capabilities, and if not, certainly our impatience for answers and action. For those who want to stretch their minds, the discipline of System Dynamics Modeling holds potentially greater opportunities to understand and control the complexity of causation (for a wealth of insights, research System Dynamics, and Systems Thinking).

- Often incomplete, and can be constantly evolving representations of an event or observable fact
- Often flawed because we frequently make errors in deducing the consequences of our fundamental assumptions
- Dependent upon feedback which itself can be generated from other mental models, or emotions, and consequently suffer in the absence of feedback
- Not easily understood, or others can interpret them differently
- Based on assumptions usually difficult to examine, so ambiguities and contradictions within them can go undetected, unchallenged, and unresolved ("Garbage in, garbage out")
- Scant on information and provide simplified explanations of complex sequences of events (Dove)
- Carry some degree of uncertainty about their validity, and even if incorrect, are still used. We cling to many Safety myths
- Representations of what is true, but not what is false (Byrne)
- Composed of sets of cause-effect rules influencing linear or sequential thought processes

Exhibit 1. Limitations of Mental Models (Sterman 4, Johnson-Laird)

Accepting our cognitive limitations, we may have no other good choice, but to utilize mental and other forms of descriptive, linear, models. When properly applied, though, models can help us sharpen our questions and open our minds to greater comprehension and new possibilities. In contrast, rigid adherence to structure and unchallenged mental models can cloud or close our minds to other possible models of reality. Our profession, like any others, has its share of mental models such as: (Manuele, 122-144. 3rd Ed.)

- how accidents are caused, e.g. the Domino Sequence of Accident Causation and a myriad other models,
- Heinrich's Foundation of a Major Injury – the 1-29-300 premise – also known as the Accident Ratio Study,
- 90% or more of accidents are caused by unsafe acts of employees (original ratio was 88% unsafe acts, 10% unsafe conditions and 2% unpreventable)
- Frequency precedes severity, and so on

Fred Manuele challenges, "Have we been reciting clichés, repeating the literature, without asking for substantiation? Do we docilely follow previously published premises, with no pretense at scientific inquiry as to foundation?" (Manuele, 141) The confident Safety Professional and organization who strive for certainty and wisdom have an obligation not to just continually improve, but to do so by continually testing, challenging and refining prevailing mental models

and those feedback mechanisms that influence individual and collective growth and improvement.

Test It Yourself – Assessing Mental Models

A revealing first step is to compare your mental model of Safety to that of others. Having personally performed this exercise many times, in groups or one-on-one, yielding a response sample that now likely numbers upwards of a thousand data points, I suspect your results would mirror mine. First, get a piece of paper and pen in 25 words or less, without resorting to a dictionary or Safety reference book, define Safety. Next, ask the same question to a random sample of people in your office or company. You might get some odd looks or blank stares. Compile their responses and compare to yours. Do they differ and to what degree? Expand your survey. At the next Safety meeting or meeting with a group of managers, supervisors or hourly workers, go around the room asking each to express what Safety means to them. Jot key words on a flip chart. Do not be surprised when you get blank stares, nervous hesitation, or no response at all. They may stumble, searching for their "right words". Observe their body language. Note how their eyes roll upwards in a cerebral-linkup attempt to tap their databank of knowledge and experience – their mental models. You will certainly get a broad range of responses. Many responses will have an emotional undertone. You might also hear, "I can't define it in words, but I know how to use it in a sentence." Roughly ten percent of respondents in the surveys could not find the right words to define Safety. Exhibit 2 summarizes the common expressions.

- Preventing accidents or injuries
- Freedom from harm or injury
- Being safe
- Being aware of your surroundings
- Not getting hurt
- It's number one!
- Following procedures and rules
- It is a state of being
- Looking out for each other
- Complying with OSHA
- Going home the same way you came to work

Exhibit 2. Safety is…

Each response is an expression influenced by the person's mental models and emotional benchmarks. The implication is not that all these definitions are wrong, for some do capture key aspects of the essence of Safety. There is, however, an all too obvious across-the-board variability and uncertainty sufficient to echo the concern expressed 30 years ago by Bill Lowrance.

Next, ask those same managers and supervisors, "How do you manage Safety?" another seemingly simple question for those who have that responsibility and perhaps accountability. Yet, a meaningful response is just as elusive. For some, it might be a troubling realization that, "I really don't know Safety or how to manage it," or they might deflect their uncertainty by saying, "You're the Safety guy, you tell us." Repeating both exercises with a group of Safety professionals will still yield a range of responses, perhaps less varied or uncertain, with less hesitation, less blank stares, but nonetheless, varied.

If defining Safety and expressing how we manage it are so varied or uncertain, how can we expect management, supervision and hourly workers to think, decide, act and behave consistent with our expectations, and similarly expect Safety performance to be any different? Reinforcing this premise, Grimaldi and Simonds, in Safety Management, wrote, "Unless there is common understanding about the meaning of terms, it is clear that there cannot be a universal effort to fulfill the objectives they define." (Manuele, 3rd Ed., 236). Fred Manuele further reinforces that point in his core tome, On the Practice of Safety:

We must agree on what we mean when we use the word Safety, as in the practice of Safety. If we cannot, how can we assume we are communicating with each other when we use the term or with those outside our profession?

A Field Test

On one occasion, as a prelude to the author conducting training on accident investigation at a company known for its commitment to Safety, nearly 150 of their "Safety Leaders" representing management, supervision and hourly were asked to write a definition of "Safety. ". Figure 3 summarizes their responses, which were consistent previous and subsequent surveys. The justification for first putting them through this reflective exercise was in part to confirm why the company was not getting acceptable and consistent quality in its accident investigations. If Safety Leaders were not meeting management's expectations, suspicions focused on:

- Lack of or ineffective training in accident investigation,
- Lack of objective standards for who is to do what, when, how
- Expectations not effectively communicated or reinforced
- No understanding of or training on accident causation
- Failure to objectively measure, monitor or provide feedback on conformance to standards

If some or all of these pitfalls existed, the logical conclusion was that they lacking in the fundamental and really did not know Safety. A quick sampling of their written responses confirmed all those suspicions. During a break, the host agreed on the spot to revamp the training agenda to include instructional modules on The Essence of Safety, and Accident Causation, before returning to the original training objective of Improving Accident Investigation.

KEY WORD OR PHRASE	PERCENT RESPONDING
Freedom from (or no) injury	26%
Used the word Safety or some form of it in their definition (e.g. safety is being safe)	22%
Awareness of surroundings, hazards or others	17%
Could not define	13%
Going home in the same condition you came to work	6%
Looking after yourself or others	5%
Correcting/Preventing hazards or injuries	4%
Being cautious or careful	3%
Preparing or planning	2%
Good housekeeping	1%
Following procedures	1%

Exhibit 3. Safety Leader Survey—"Safety Is…" (Sample size: 137)

Resetting the Foundation – Defining Safety

Dictionary definitions of Safety are commonly referenced in Safety literature, and the use of those serve to reinforce mental models of Safety, or being safe, as voiced or written as 'the quality of being safe, freedom from danger or injury, free from or not liable to danger, involving no danger, risk or error.' (Manuele 57) We are never fully free or fully safe for safety is relative, and chance and risk are life's constant companions. The following definition, slightly modified from Fred Manuele's, and appearing in the most recent edition of the National Safety Council Accident Prevention Manual – Engineering & Technology, underpins the essence of what Safety really is. From this definition, flow a philosophy and structure for managing Safety (another of my mental models), and an opportunity for improvement.

Safety is that state of being when risk and the hazards derived from them are judged acceptable or in control.

That is it, plain and simple. Safety is no more and no less than a condition or judgment of acceptable control over hazards and risks inherent to what we are doing at a point in time or choose to do at some future point. That state of being can be personal or a reflection of the business culture. Imada (621, with author's annotations) similarly, though eruditely defined Safety as "a momentary and on-going condition [state of being] where elements [hazards and risks] are under control because of the homeostatic [acceptable] conditions of causes and preventions [controls]." Bird and Germain (4) simplify that with their definition of Safety, "The control of accidental loss." The ISO/IEC Guide 51 – Safety Aspects – Guidelines for Their

Inclusion in Standards defines Safety as freedom from unacceptable risk. (Manuele, 3rd Ed. 58) Lowrance defined Safety "as a judgment of the acceptability of risk." (Lowrance, 8) Common threads through all of these definitions are "control" and "acceptable," words themselves likely to garner varied interpretations and demand defining. So too would Lowrance's use of "judgment." Nonetheless, in my mental model, achieving "acceptable control" is the defining construct of Safety Management and represents our true journey. To sidestep from this line of reasoning for a moment, readers might now be wondering, "What is control?" A participant in one of my training classes, in debate on the essence of Safety, quipped, "Control is an illusion. We are never in control." He may be dead right on that point, but "acceptable control" is definable and achievable. For those who still want that question answered, the author offers this definition:

Control is functioning within dictated, perceived and/or accepted standards, limits or boundaries.

Hazards inherent to the business process, especially those not controlled to an acceptable level represent our challenge. The potential outcome from an uncontrolled hazard is harm, not just to people, but also to equipment, materials, production, property, environment, profits and the one super-critical business loss exposure - your company name, brand reputation, integrity or image in the marketplace or in the public eye.

Essential Functions of a "Manager"

Manager in this title is in quotations to imply its broadest scope, encompassing anyone who has a role in affecting the business process, regardless of job title, position, or significance of their contribution to that process. In a traditional business model, all "managers" to one degree or another, plan, organize, lead (sometimes self-directed) and control something, if nothing more than a tool or machine (Bird and Germain). If "control" is a core function of all managers, Safety, therefore, is a fundamental, essential and functional responsibility of all who are engaged in managing the business process to an acceptable, controlled, level. It follows from there that everyone from the most senior manager to the newest employee are in essence "Safety managers" or more appropriately, "hazard control managers." All have a fundamental responsibility to control hazards, risks, losses (e.g. claims management and other loss mitigation strategies) and other downgrading influences (e.g. loss of customer confidence, market share, intellectual capital or brand image) potentially adversely affecting the business process. Unfortunately, most "managers" as the surveys showed, have varied mental models of Safety, uncertainty in their role of managing it, nor realize and accept that they have this title, the role, the responsibilities and accountability that accompany it. This perception gap, or chasm, may well be one root of why we Safety professionals struggle for identity or influence, or why our initiatives sometimes fail to achieve the desired Safety performance improvement, and why our incidence rates reach plateaus despite best efforts and intentions. If all "managers" can accept this new role to control hazards, instantly, all gain a new job title, no raise in pay, just an additional title, but a critically important one for continuous improvement of the business process. To realize that goal, hazard control managers must receive the requisite awareness, training and skills.

Next Logical Progression: The Essential Functions of a Hazard Control Manager

So, what should a Hazard Control Manager do? (Modified from Bird and Germain, 29, and Manuele, 3rd ed. 68)

- Anticipate or identify hazardous conditions, practices or loss exposures
- Evaluate and prioritize using risk assessment methods focusing on the worst first (high potential). Some risks are more significant than others are, and not all hazards present equal potential for harm or damage (Manuele, PS, 30).
- Develop controls: programs, policies, procedures, standards and expectations
- Implement , administer, and advise others on hazard controls and hazard control programs
- Monitor, measure, maintain, or improve those programs and the business process to achieve an acceptable level of control

When Safety practitioners or senior managers express by policy, or otherwise make employees aware that they are "all responsible for Safety", these essential functions represent what we really need them to embrace and do. Doing so makes that many more "disciples for Safety," and magnifies your company's ability to affect control from the limited capabilities of one titled "Safety Manager" to whatever is number of employees in your organization. With so many more eyes looking for hazards and assessing risks, and so many more minds thinking the same mental model of Safety, with certainty of their responsibilities and abilities to manage control of their particular dimension of the business process, the potential outcome can only be measurably greater. Safety and the system become one.

Activities of Managing Control – A Structure

So, how do we get, or what does it take to get, control? Whether you are managing the Safety function, a task, the business as a whole, or for that matter your personal lifestyle, there are three opportunities or stages to managing control – Pre-Loss, Contact (e.g. PPE) and Post-Loss, plus the following activities help answer that question by defining a structure or strategy for continuous improvement: (Modified from Bird and Germain, 47)

- Identify what is necessary to achieve success or a desired level of control. This represents the collective body of traditional Safety process elements (Pre/Contact/Post), procedures, regulatory requirements, and whatever other hazard-specific controls or other innovative ideas deemed necessary to achieve acceptable control
- Set standards of performance or expectation. Define objectively, who does what, when, how, with what level of quality, quantity
- Communicate those standards or expectations to whomever is affected or whose role it is to meet or fulfill the standards
- Measure and evaluate performance to those standards and expectations. This activity represents the heart of control, for "what gets measured, gets done". Strive for a proper balance of upstream, activity-based, and traditional downstream, reactive, metrics. This sets the stage for feedback,

- Commend or constructively correct performance to standards. Lastly,
- Go back to each activity and make it better

This is but one model of how to manage control. The ANSI Z10 consensus standard for Occupational Health and Safety Management Systems is another model for control that should become the guiding construct for Safety management in the US in the 21st century. OSHA regulations, consensus, and regulations in general, are other forms of "control," but these typically are minimum conformance or performance levels.

Seize the Opportunity—Realign Mental Models

Get back to basics. Testing (identify and evaluate) the prevailing Safety mental models in your organization is a good place to start. If those models are as varied as my experience and surveys attest, look at those mental models as high potential hazards needing control. Develop, implement and monitor means to reshape those models to increase awareness of what Safety is and how to manage it. Enhance safety knowledge, hazards awareness and skills to achieve a single-minded vision and understanding that the Safety responsibility of all your "hazard control managers" is to function as one mind to control all potential hazards and downgrading influences to the business performance, and continue on that journey ever-striving toward an acceptable level of control. Develop their abilities to "see" potentials and prevent or control them before they "take shape." Evolve your focus away from a traditional regulatory-driven, programmatic, or promotional perception toward a wide-eyed, open-minded and single-minded vision of "Safety of the entire business process". Dare to break from a tradition of "SAFETY FIRST," "THINK SAFETY" and "SAFETY IS YOUR RESPONSIBILITY" and replace those decades-old paradigms with "CONTROL FIRST! THINK CONTROL! and CONTROL IS YOUR RESPONSIBILITY!" Strive for that personal and organizational mastery where every one of your "hazard control managers" can state with confidence and certainty that they intimately know Safety and how they and [insert your company name] manage control. As I concluded my research for this editorial, I came across a potentially mental-model-shattering thought from Margaret Wheatley's best-seller, *Leadership and the New Science*, where she quotes Erich Jantsch (*The Self – Organizing Universe*, 1980), "In life, the issue is not control, but dynamic interconnectedness." Maybe my mental model about control being the defining construct in safety is wrong. Then again, I can spin that to fit my model by rationalizing that "dynamic interconnectedness" is nothing more than a network and the dynamism in a network or system comes from a single-minded, self-organizing, vision (of safety). That's the world as I see it. What's in your mental model?

References

ANSI Z-10 – 2005. American National Standard for Occupational Health and Safety Management Systems. American National Standards Institute and American Industrial Hygiene Association.

Byren, Ruth. http://www.tcd.ie/Psychology/Ruth_Byrne/mental_models/.

Bird, Frank and Germain, George. *Practical Loss Control Leadership.* Georgia. Institute Publishing. 1985.

Dove, Laura. www.lauradove.info/reports/mental/20models.htm

Holland, J.H. Holyoak, K.J., Nesbitt, R.E., Thagard, P.R. I*ntroduction: Processes of Inference. Learning and Discovery.* Cambridge, MA: MIT Press. 1986.

Imada, Andrew S. *Ergonomics: Influencing Managerial Behaviour. Ergonomics*. Taylor & Francis. Vol 33, No. 5(1990): 621-627.

Johnson, Laird and Byrne, Ruth. Mental Models Website – A Gentle Introduction. http://www.tcd.ie/psychology/Ruth_Byrne_models/. June, 2005.

Manuele, Fred A. *On the Practice of Safety.* Wiley Interscience, 3rd Ed. 2003.

Manuele, Fred A. "Principles for the Practice of Safety." *Professional Safety*. July 1997.

Sterman, John D. A Skeptic's Guide to Computer Models. Road Maps – MIT System Dynamics in Education Project. D-4101-1. Massachusetts Institute of Technology.1997. (http://www.sysdyn.mit.edu/road-maps)

Gonzalez, Lawrence. Deep Survival. W. W. Norton Co. 2003

Lawrence, William, W. *Of Acceptable Risk.* William Kaufmann, Inc. Los Altos, CA. 1976.

Wheatley, Margaret. *Leadership and the New Science.* Berrett-Koehler Publishers. 2nd Edition. 1999.