

Understanding and Improving Cultural Receptiveness to PSLM in the Risk Optimization of Process Facilities

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Abstract:

Process Safety Management is an established approach to application of technical solutions and crisply focused management principles and systems to prevent process-related loss. Efforts to parachute it into an existing culture often meet frustration. Visionary leadership is required to foster a culture of risk optimization as a way of life for the organization. Leaders must understand differences in how people and groups of people direct their energy, process information, make decisions and structure their behaviour. Leaders must also understand the various ways groups of people learn as they transform data and information into knowledge and wisdom. These leaders will then be much better positioned to be successful in developing a workplace culture receptive to the Process Safety Management discipline.

Introduction:

I am in my fourth year as the PSM Division's ambassador to the pulp and paper industry and it has been constructively frustrating. The first reason is that what we see as our most significant process safety risk has been well covered by the single-issue and highly expert Black Liquor Recovery Boiler Advisory Committee for over forty years. Other risks are so small in comparison that we have not really got to them, up until now. Ertugrul Alp and I will be talking with you about one of the next priorities on the list tomorrow morning.

Changing a culture takes momentum. In my minor hockey extra-curricular pastime, I've been enlisted to help drive a much-needed cultural change. We're moving assertively from the old macho tough-guy sport to a safe and fun recreational activity that develops future citizens. Not everyone with a deep hockey background is up to the challenge of changing. I found out later that I'd been scouted extensively before being tapped for this assignment. I believe Hockey Canada has it figured out. They understand the physics of momentum. It's mass multiplied by velocity; you get enough people going in the right new direction and things will start to change.

I've made the simplifying leap of logic that PSM deals with not just safety. Not to suggest safety is unimportant, but PSM is broader than that. It deals with all aspects of loss exposure risks. I'm taking the approach that you don't manage risk, you optimize it. Risk Optimization is the term I've used to signal that PSM is still relevant

in process industries, even if they do not abound in materials that can catch fire or blow up.

Consideration and optimization of risk, on a continual basis, has to become a mindset in your management strategy. It is an approach that is compatible with virtually any management structure. When performed properly, it involves active participation of people at all levels. Threats and opportunities are tied to each other. They are the opposite sides of the same coin. And it's not just a matter of being defensive. Effective risk management is, or at least should be, a source of competitive advantage.

Understand that effective decision-making about risks has to involve everyone in the organization to ensure that no important knowledge and experience is overlooked. It's not an academic exercise restricted to staff risk management experts! But getting everyone or even a critical mass of employees and stakeholders on board may prove more difficult than you expect. How different people react when presented with a set of data and information can be very dynamic.

Understanding Your Total Risk Situation

Risk influences are the factors that shape an organization's total risk picture, both the threats and opportunities they present, and in the organization's ability to respond to them. Your objective has to be to mould your total risk situation to do the best job of meeting the needs of a certain situation. Then you will be able to capitalize on opportunities while minimizing undesirable outcomes.

It is very important not to oversimplify the identification process for risks. The discipline is enhanced by breaking the total array of possible risks into categories. There is no one right set of categories but one approach groups the array of risk influences into four categories: experience, culture, systems and environment. I plan to deal with the first two today: experience and culture and how they overlap.

There are two things you really have to understand as you set out to foster a culture of risk optimization: (1) people and teams differ in where they preferentially direct their energy, how they prefer to process information, how they prefer to make decisions and how they prefer to organize their lives; (2) there is a progressive process in which an individual's or a team's experience in the form of data and information is transformed into knowledge and wisdom.

Models of Individual and Team Personality:

Before we look at the generics of synthesizing data into knowledge by a typical average person or team, let's consider the various ways that individual persons can differ from the average centre-of-the-crowd person, if such a person exists. Numerous systems have been developed to do this analytically. I'd like to briefly describe one I've found useful. It is the Myers-Briggs model which I encountered through Bernard Haldane Associates in 1998. I was shocked with how insightful it was!

Direction of Personal Energy

Where, primarily, do you direct your energy? Is it to the outer world of activity, and spoken words or to the inner world of thoughts and emotions? If it is toward the outer world of activity or words, it is called Extroversion, denoted by the letter E. If it is toward the inner world of ideas, information, or thoughts, it is called Introversion, denoted by the letter I.

In a sufficiently large sample of adults in the western or “first” world, 70-75% of individuals are Extroverts and 25-30% are Introverts. As engineers, much of our professional education encourages us to consider before we act. We should never be surprised that two-thirds or more of the people around us seem to be impulsive, by comparison.

Information Processing

How do you prefer to process information? In the form of known facts and familiar terms or in the form of possibilities or new potential? If it is in the form of facts or familiar terms, it is called Sensing, denoted by the letter S. If it is in the form of possibilities or new potential, it is called iNtuition, denoted by the letter N (N is used rather than I, to avoid confusion with Introversion). The term Sensing is used because information is taken in primarily by way of the five senses. The term iNtuition is used because information is subconsciously manipulated, primarily in an intuitive fashion.

Sensing tends to be interested in tangible reality, focusing on the present, and seeing what is, rather than what might be. The preference for iNtuition gives a greater emphasis on insight and the future, focusing on what might be, rather than what is.

Sensing tends to communicate in direct ways, while iNtuition prefers to communicate in more subtle ways. In that same sample of people, 75-80% process information by Sensing and 20-25% by iNtuition. If we happen to be in the minority that is comfortable taking a high-altitude big picture approach, looking for trends and patterns, we should not be surprised that the vast majority of people around us don't seem able to see the forest for the trees!

Decision Making Basis

How do you prefer to make decisions? On the basis of logic and objective considerations or on the basis of personal values?

If it is on the basis of logic and objective considerations, it is called Thinking, denoted by the letter T. If it is on the basis of personal values, it is called Feeling, denoted by the letter F. The same population group tends to be split 50-50 between Thinking and Feeling. PSM is a rational, logical discipline. Don't be surprised if half of any group of people sees it as too inflexible and unable to accommodate individual preferential differences.

Organization of Personal Life

How do you prefer to organize your life? In a structured way, making decisions and knowing where you stand or in a flexible way, discovering life as you go along? If it is in a structured way, making decisions and knowing where you stand, then it is called Judgement. If it is in a flexible way, discovering life as you go along, this is called Perception.

Someone whose preference is Judgement prefers, in their lifestyle, to make decisions. This means that they prefer to make decisions about what to do, where to go, what to say, and so on. As a result of these decisions, their lifestyle appears organized or inflexible. Someone whose preference is Perception prefers, in their lifestyle, to learn or experience new things. This means that they prefer to find out more, rather than making decisions, and are more comfortable when they keep their options open. As a result of this openness, they can appear indecisive.

The same sample group tends to be split 50-50 as well between Judgement and Perception. If you want to use PSM to give you more control of your business destiny, you may find half your work group wanting to wait and see if it is really needed or not.

Distribution of Behaviour Types

As you've seen, The Myers Briggs model of personality is based on four preferences: Where, primarily, do you direct your energy? How do you prefer to process information? How do you prefer to make decisions? How do you prefer to organise your life? Simplistic as it may seem, four questions, each with two possible answers means $2^4 = 16$ different possible combinations. Is it possible to condense the total array of human behavioural types this way? Try it as I did and see for yourself!

Your type is a permanent influence in your personality. It influences your choice, where the opportunity allows, of which preference or team role to perform. The letters that represent your preferences are combined to produce your Myers Briggs Type, such as ENTJ. Looking at the splits in prevalence indicated above you will find the following:

The ES Quadrant

The most prevalent group will be the 50-55% of the population who are Extroverted-Sensing type people. That means their primary direction of their energy is to the outer world of activity, and spoken words which normally increases their level of energy. When there is a free choice, they will tend to act, rather than tend to think. They are comfortable working with known facts and familiar terms, interested in tangible reality, focusing on the present, and seeing what is, rather than what might be. At an extreme, they can have its feet so well and truly on the ground that it misses out on possibilities for the future. The dominant function in this group is the Sensing characteristic but there is evidence of Thinking and Feeling characteristics in this group as well.

The IS Quadrant

Approximately 25% of the population is Introverted-Sensing type people meaning they tend to direct their energy primarily, to the inner world of thoughts and emotions which normally increase their level of energy. When there is a free choice, they tend to think before acting. They are comfortable working with known facts and familiar terms interested in tangible reality, focusing on the present, and seeing what is, rather than what might be. The dominant function in this group is the Sensing characteristic but there is evidence of Thinking and Feeling characteristics in this group as well.

The EN Quadrant

Approximately 20% of the population is Extroverted-iNtuitive type people. Their primary direction of their energy is to the outer world of activity, and spoken words which normally increases their level of energy. When there is a free choice, they will tend to act, rather than tend to think. They are most comfortable dealing with the form of possibilities or new potential. At an extreme, they can focus so much on possibilities that they lose touch with current realities. The dominant function is the iNtuition characteristic, but there is evidence of Thinking and Feeling characteristics in this group as well.

The IN Quadrant

The least prevalent group, representing 4-5% of this typical population, is Introverted-iNtuitive. They tend to direct their energy primarily to the inner world of thoughts and emotions which normally increase their level of energy. When there is a free choice, they tend to think before acting. They are most comfortable dealing with the form of possibilities or new potential. At an extreme, they can focus so much on possibilities that they lose touch with current realities. The dominant function in this group is the iNtuition characteristic but there is evidence of Thinking and Feeling characteristics in this group as well.

Seeing the Various Types on the Job

My analysis, performed by Bernard Haldane Associates in 1998, showed me to be an ENTJ, someone who prefers Extroversion, iNtuition, Thinking and Judgement. The ENTJ is likely to feel energised by having lots of things going on (E). He will tend to interpret events by seeing patterns or high-altitude overviews (N). He will tend to make decisions on the basis of logic (T). And he organises life on a structured basis (J). So here I stand, not just thinking about it, but promoting to you the notion that PSM is more broadly applicable than has been recognized. I'm trying to get you to change direction through a logical discussion. Does that sound like an ENTJ? I'd say so.

Your innate preferences primarily influence the way that you behave. The team role you perform depends on a combination of the demands being placed on you. But the root of the Myers-Briggs model is that your type is innate and stays the same throughout adult life.

Data and Information to Knowledge and Wisdom

Experience is the working sum of individual experiences of leaders and employees, their collective shared experience and the experiences of others, particularly stakeholders and superiors. The experience an organization has already had can have major impact on how it perceives its risk situation, its actual level of risk, the kinds of risks it is willing to assume and how readily it can respond to risk. It represents what the individuals and the weighted average of the groups have learned, whether good or bad.

Knowledge Management

Knowledge management, intellectual property and human capital are concepts that have raced to the forefront of business jargon over the past fifteen years. In-depth coverage is well beyond the scope of this paper but let's quickly take an overview of the field.

Data

Data refers to discrete, objective facts about events. In an organizational context, the word data refers to structured records of events. Data are created with facts so a piece of data can be thought of as a fact.

Data is the building blocs of meaning. It has no context except for its relationship to other bits of data. Without further context, data is meaningless as the user cannot determine where it came from or why it is being communicated. Data includes such things as lists of temperature, scores, and bits of news. Note that data can pose as information. For example, trivia and bits of news is just data; it has nothing to teach us. In addition, what constitutes data to one person, may in fact be information to another person.

Information

Information emerges from the form that data takes as it is arranged and presented in different ways. The "massaging" of the data adds more context to it and allows us to understand something about the data presented. Researchers often describe it as a *message* that is communicated. As with any message, it has a sender and a receiver. The purpose is to change the receiver's way of perceiving something so as to cause an impact on her judgement and behavior. Inform originally meant to give shape to; while information is meant to shape a person. Think of information as data that makes a difference.

Shareability refers to the extent to which information can be exchanged. Information has high shareability if it is easy to exchange between different individuals without loss of fidelity. Internal information, e.g. perceptual, emotional, imagistic information often is qualitatively different from external information, e.g. spoken, written information, and that means internal information is often not particularly shareable.

Knowledge Dynamics

Knowledge creation is essential! It's what makes people and organizations smarter. That refers to the ability to make the leap from data and information to synthesize knowledge from and disseminate the resulting understanding through the organization and implant it in its products, systems, processes and internal environment. Two kinds of knowledge have to be considered.

Explicit Knowledge is the stuff that can be expressed in formal grammatical sentences, mathematical relationships, technical specifications and so on. It's at the core of formal education in general and very much so in the case of an engineering degree. It can be articulated into formal language, including grammatical statements, mathematical expressions of scientific phenomena, specifications and manuals. Explicit knowledge can be readily transmitted others. It can easily be processed by a computer, transmitted electronically, or stored in databases.

Tacit Knowledge is the softer intangibles like beliefs, perspectives and values. It is more subjective, laden with insights, intuitions and hunches making it much tougher to communicate. It is generally less formal in its origins and grows out of personal knowledge embedded in individual experience. It involves intangible factors, such as personal beliefs, perspective, and the value system. Tacit knowledge is difficult, although not impossible, to articulate with formal language. Before tacit knowledge can be communicated, it must be converted into words, models, or numbers that can be understood. Tacit knowledge is sometimes called implicit knowledge. There are two dimensions to tacit knowledge:

(1) Technical knowledge refers to skills and crafts..."know-how", "knack", "technique", procedural things. This folds in the kind of informal skills often considered *know-how*. A tradesperson or process operator develops a wealth of expertise after years of experience. But they often have difficulty expressing the technical or scientific principles of his or her craft. Highly subjective and personal insights, intuitions, hunches and inspirations derived from personal experience fall into this dimension. This is a real challenge in formalizing practices.

(2) Cognitive knowledge refers to figurative language, symbolism, mental models, beliefs and perceptions so ingrained that they seem subconscious. This dimension consists of beliefs, perceptions, ideals, values, emotions and mental models so ingrained in us that we take them for granted. Though they cannot be put into words very easily, this dimension of tacit knowledge is extremely important since it shapes the way we perceive the world around us and how we look at the need for new approaches such as PSLM.

Creation of Organizational Knowledge

Organizational knowledge is what we are driving to create and it is "created" when difficult to explain tacit knowledge is converted to more shareable explicit knowledge. It also happens when the reverse happens, when explicit knowledge is converted to tacit knowledge in effective refresher training. There are four basic mechanisms in

which knowledge creation happens, and it is really valuable to understand them and personalize them.

Combination...explicit to explicit: Process of putting knowledge into conventional information systems. Individuals exchange and combine knowledge through media, such as documents, meetings, and conversations. Information is reconfigured by such means as sorting, combining, and categorizing. Formal education and many training programs work this way. As chemical engineers or more generally, as formally educated professionals, we do this routinely in conferences and peer networking opportunities.

Internalization...explicit to tacit: Closely related to "learning by doing." Normally, knowledge is verbalized or diagrammed into documents or oral stories. This is very much recognized and acknowledged and is the channel through which most traditional classroom-type training occurs.

Socialization...tacit to tacit: Sharing experience through shared mental models. Sharing experiences to create tacit knowledge, such as shared mental models and technical skills. This also includes observation, imitation, and practice. However, "experience" is the key, which is why the mere "transfer of information" often makes little sense to the receiver. This is the mechanism at play among peers in operations control rooms and maintenance shops throughout industry. It's the core vehicle of buddy training. More subtly, it is the process through which the informal organizational culture perpetuates itself, much to the frustration of change agents who are unable to recognize and manage it.

Externalization...tacit to explicit: Key to creating new knowledge ...understanding converted to statements. The quintessential process of articulating tacit knowledge into explicit concepts through metaphors, analogies, concepts, hypothesis, or models. Note that when we conceptualize an image, we express its essence mostly in language. This may be the softest of the four and certainly the least emphasized in our technical education process. As a teenager, I learned more from my Dad about the value of learning from older and more experienced, although less formally educated people, than I did in four years of university education. In my personal assessment, it has been at the core of the success I have enjoyed in my career.

Wisdom

Wisdom is the ultimate level of understanding. We get there when we see enough patterns and trends that we are able to synthesize and then use them in novel ways. Wisdom is not easily passed from one person to another as it must be worked for. However, recognizing and valuing the wisdom in others will help define a framework for achieving it.

Zooming

Every organization that has been successful has been made up of detail-oriented and concept-oriented people. Concept-oriented people, as represented by the 20% of the population in the Myers-Briggs "EN" quadrant, have tended to migrate towards the managerial positions in an organization where their tendency to pull back and focus on the big picture and interrelationships makes them productive. Rank-and-file doers, on the other hand, are most successful if they are detail-oriented people. These are the 80% of the population in the other three quadrants, "ES", "IN" and "IS". They can mentally zero in and focus on the smallest elements of whatever they are working on and that makes them productive.

People who can manage their preferences and develop the ability to be detail-oriented some of the time and concept-oriented at other times can be in the strongest possible position to contribute. Even if they spend most of their time in their dominant mode, there is still advantage in being able to adjust focus, like a telephoto to wide-angle zoom camera lens. Successful reorganization efforts are those that make people comfortable in a situation where they can switch back and forth to make a richer contribution.

Since the industrial revolution began with the invention of the spinning jenny nearly 250 years ago, every modernizing step has been to divide jobs into parts, leaving no one with a sense of accountability for the quality of the overall job. We must give back control so each employee can feel a sense of contribution. People in the rank and file "doer" category who can zoom up into the high level perspective of how their job contributes are able to shift back to their functional level and contribute the value of their insight and achieve more satisfaction from their job.

Leaders who understand their business to the extent they can zoom down, offer guidance or pose constructive questions and then zoom back up and step aside and let their people perform, demonstrate competence in a very visible way and provide a critical factor in the competitive performance of an industrial organization.

Making Risk Optimization Permanent

When you think about institutionalizing risk optimization, think in terms of building a dam. You convert the threats of flood and drought into the opportunities of power generation and irrigation. The goal for the entire organization has to be holding on to achievements already in place, while consistently making decisions that maximize opportunities and minimize threats.

Risk Optimization does not try to eliminate 100% of all threats nor does it attempt to achieve 100% of all opportunities. Trying to do so, on a sustained basis, will result in paralysis or burnout. What we have to be shooting for is to sustain, over the long term, what has already been achieved; always understand our total risk situation in all situations, not just a few select cases and continue to achieve a proper balance between capitalizing on opportunities and developing contingencies against threats throughout our operations and business areas.

Consideration and optimization of risk, on a continual basis, has to become a mindset in your management strategy. It is an approach that is compatible with virtually any management structure. When performed properly, it involves active participation of people at all levels. Threats and opportunities are tied to each other. They are the opposite sides of the same coin. And it's not just a matter of being defensive. Effective risk management is, or at least should be, a source of competitive advantage.

The fundamental values of an integrated approach to risk optimization are that your decision-making process will be more informed; your efficiency of capital expenditures will be improved; the confidence of directors and investors will improve and responsiveness to corporate governance needs will improve.

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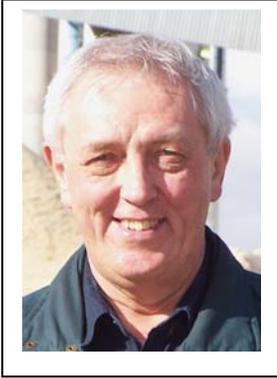
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General Manager of Pope & Talbot Ltd. in Mackenzie, British Columbia, Tom hails from Charlotteville Township in the heart of the Carolinian Forest Region on Ontario's "South Coast", graduating from secondary school in Port Dover in 1965. His qualifications include B. A. Sc. (Chem. Eng.), Waterloo, 1970 and P. Eng. certification (BC and ON) supporting 35 years of experience in six Canadian kraft pulp operations, coast to coast. In April 1999, he was appointed general manager of the Mackenzie 230,000 tpy bleached chemical market pulp mill with 255 employees and gross annual sales of \$200 million.

He has 35 years of technical, engineering, operations and capital project experience in pulp and paper mills in three provinces.

His career spans ever-increasing levels of responsibility: process engineer, maintenance & engineering manager, pulp production manager, paper production manager and general manager, primarily in kraft pulp manufacturing, supplemented with production responsibility for groundwood specialty paper.

He is a member of the Pulp and Paper Technical Association of Canada, where he has served on three committees, and also of parallel organizations in USA and Brazil. He is a member of the C. S. Ch. E., which he currently serves as Process Safety Management Division Chairman and has recently been elected a Director for 2006-08.

He has just concluded three and a half years as Chairman of the Board of CHMM-FM which saw the launch of a successful community radio station. He is a Rotarian, is District Coach Mentor Coordinator with the B. C. Amateur Hockey Association; is the manufacturing industry spokesman on the Mackenzie Community Policing Committee, serves on the Chemical Engineering Industrial Advisory Council at UBC and is President of the B. C. Forest Industry Health Research Program.