

Profound Knowledge: Taking Safety Management to a Higher Level

By Thomas A. Smith



“Profound knowledge provides a map of theory by which to understand the organizations we work in.”

W. Edwards Deming

One of the toughest challenges for safety management is to get people to participate, practice and integrate safety with daily work routines. Especially when employees are working with little no supervision which is the rule rather than the exception in today's *lean* management systems. Safety problems can range from people not following a simple rule such as wearing personal protective equipment to ignoring signals something is seriously wrong and a disaster might be imminent. This “failure to communicate” to make safety a constant integral part of management and job routines affects all operations regardless of complexity. It was identified as a major contributor to the Challenger and Columbia space shuttle disasters and is common in typical manufacturing operations. ¹

It's not as though we have been ignoring safety and the difficulties of how to manage it. Modern safety management has been around for at least 100 years. The National Safety Council was formed in 1913. OSHA was enacted in 1971. The problem is when things go awry American managers have been trained to focus on finding out who did something wrong and take corrective action based on what they learned from investigating that event. We need to look at safety with a new set of eyes if we are going to do a better job of helping workers work safely.

Let's compare how two mental models of safety management would address this challenge. The first is based on the command and control management system of which most of us are quite familiar. We will call it the *Thou Shalt* method. The second takes its direction from continual improvement management which challenges all the conventional wisdom of the first. We will refer to it as the *What Do You Think?* Method.

The *Thou Shalt* Model

“There are two theories. One says ‘There is a problem, let's fix it.’ The other says ‘we've got a problem, someone is screwing up, let's go beat them up.’ To make improvement, we could no longer embrace the second theory, we had to use the first.” A supervisor's feedback on managing for continual improvement.

In our hypothetical example (based on a lot of real-life experience) we will look at the problem of people not wearing protective equipment (PPE). Our hypothetical company provides PPE to workers and they are trained about why it is required, how and when it should be worn. Management makes it clear workers must comply with the safety rule to wear PPE in designated areas. Workers sign an attendance sheet to prove they have been trained. To show its commitment to safety, management conducts periodic safety inspections. Recent inspections reveal some workers still don't wear their PPE as required.

When this happens *Thou Shalt* managers push harder on employees to comply with what they see as an easy to understand common sense safety rule. They remind workers at safety meetings and by written memos management has done its part. The company provides PPE and the workers must

wear it. It is also an OSHA requirement. Workers are constantly told safety is a shared responsibility between them and management. Since management has done its part workers must now do theirs and they will be held accountable. If they don't comply with safety rules they will be reprimanded. If they are reprimanded more than three times they can be terminated. Everyone must comply with the rule. It just takes common sense, a positive attitude and discipline by the workers. This is seen as a reasonable approach to the problem. Deep down inside these managers believe this is the best way to manage a safety program.

This approach has also referred to as Brute Force Management. It is common in cultures where managers consider employees to be "resources", "human capital" or just bionic machines. These managers use many different and subtle forms of fear to motivate workers. They are constantly reminding workers about consequences because they believe that's what drives all human behavior, especially unsafe actions. (It does not, that's mostly true for lab rats from whence the theory came.) They feel if workers don't follow simple common sense rules which are there for their own protection the responsibility for safety falls mostly on the worker, not management. Deep down inside these managers believe this is a fair way to run a safety program.

For Thou Shalt managers solutions for safety problems are simple, neat and easy to understand. They believe a system is the sum of its parts. That means $2 + 2$ always = 4. From the workers perspective things aren't so obvious. When this model is applied to safety it reinforces the application of the fundamental dysfunctional management behavior created by Thou Shalt methods. Needless to say it does not build a warm fuzzy, friendly relationship between management and workers.

The *What Do You Think?* Model

The second mental model found in companies that truly manage for continual improvement we will call "*What Do You Think?*" In this model management realizes when it comes to safety we shouldn't abandon common sense but it shouldn't be our only problem solving method. In this model managers learn and apply *systems thinking*. They understand how the whole can be something more or less than the sum of its parts. That means in a bad system $2 + 2$ can equal 1 but in a good system it could result in 7 or something higher. These managers don't rely on an inspection to confirm compliance or to control people. Instead they learn to gather data from processes so they can be more confident about their assessment of how things are going and how to address problems.

Management understands what's critical about data is how you interpret and react to it. *Thou Shalt* managers treat every data point as though it is either good or bad. By limiting the solution of safety problems to common sense they invariably see the workers as the source of safety problems. *What Do You Think?* managers have acquired a different theory and tools to study data and gain a better understanding of what the numbers mean. They've learned most outcomes, including outcomes represented by data, are a result of interactions of the parts of the system. Data can help you discover if something "special" or unusual has occurred in your operations or if the variation, i.e. the number of accidents every month, is the product of the system itself or something unusual from outside of the system.

What do You Think? Managers understand if safety performance is being driven by common causes in the system, management actions should be focused on fixing the system. The *Thou Shalt* approach of placing blame won't help you here. In fact it will cause more problems since it keeps the focus of corrective action on individual workers and their behaviors not the system. How you react to systems problems is better done at a higher level of thinking about management. Fortunately Dr. Deming created a four part system to do this which he referred to as profound knowledge.

Profound knowledge

What Do You Think? Managers realize they don't have all the answers. They have expanded their problem solving skills to include Dr. Deming's system of profound knowledge. Profound knowledge is actually a system to help management do a better job of observing, understanding and improve how we work.

Profound knowledge has four parts:

- *Systems*
- *Knowledge*
- *Variation*
- *Psychology*.

All four parts are all related and cannot be separated from each other. They are linked together and influence each other.

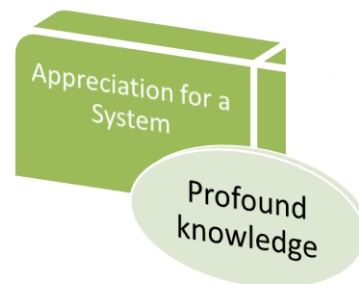
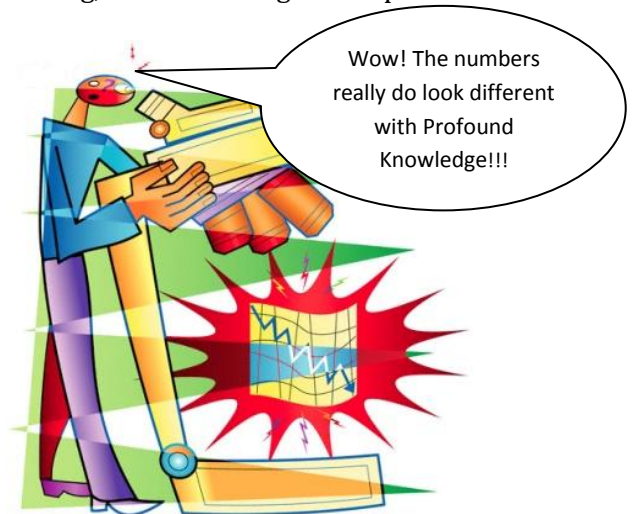
For example knowledge about psychology is incomplete unless you have knowledge about variation. When top management understands systems and variation they will not participate in or design a plan for ranking the safety performance of departments. If you have ten production lines one will always be at the top and one at the bottom no matter what.

One must have knowledge about systems to understand that different people placed in the same system will produce similar results. Deming proved this time and again with his Red Bead experiment. Systems thinking helps you realize unsafe actions in a work system are symptoms not causes. You don't have to be some kind guru to apply and gain profound knowledge. Just knowing and learning about it will elevate your understanding about the world around you and the world of work. It will help you look at things through a new set of eyes.²

Managing requires leadership at all levels. Leaders must have some understanding about knowledge and making predictions, what is a system, variation and psychology. We must transform the prevailing style of management which encourages win-lose relationships through competition to optimization of the whole system through cooperation. Combining the four components of profound knowledge will help people work together and cooperate to optimize the system.

Systems - systems thinking

Systems and systems thinking is a revolutionary mindset. It gives management and workers not only the ability to think and learn about systems but how to improve them. Very few people truly understand what is a system. Most managers grasp how machinery and equipment are parts of the work system. But that's as far as it goes. They do not consider how recruitment, training, supervision and things that help production workers do their job are also parts of the system. Because people are part of the system they need help to do their jobs better and safer. This includes teaching everyone how to manage for continual improvement and apply it to safety in a system.



Thou Shalt managers believe you get the most out of the business when each department is working at its maximum capacity. But in a quality management system you realize each part is dependent on at least one other and can be influenced by things of which you have no control. How all the components of a system work together determines how well a system operates. Therefore the final outcome of a system is not just the sum of the parts but the product of the interactions of the parts of the system. These interactions are responsible for most of the scrap, defects, rework and employee accidents. Not all of them but the majority of them.

In this world managers understand there are instances when one component may operate at a loss so the system as a whole will be optimized. An example of this is when production must be curtailed so employees can participate in a safety training session. For a short period production loses but in the long term the company gains because safety is made better.

Dr. Russell Ackoff realized we must have a new way of studying systems. He would point out that from a very young age we are taught to use analysis to figure things out. Analysis involves breaking the problem into parts to isolate them to determine what is wrong. Then fix what is wrong with the part, put things back together and expect things to work properly. Analysis is OK if you are only concerned with fixing problems detected from the output of a system or for answering *what* questions. *Thou Shalt* managers use it to determine who is not doing what they were suppose to. Analysis is enough when you are managing for quantity where departments are intentionally separated and independent from each other. But it isn't enough to understand a quality management system where individual departments are interdependent on each other. They must work cooperatively, not in silos, with the aim of improving the system.

An example of how analysis misses the mark when it comes to studying a system can be seen by what happened when American managers visited Japan in the 1980's to learn how the Japanese managed differently. The Americans used *analysis* to study the Japanese system and saw quality circles, the output of the system. They did not use *synthesis* and missed the whole. Quality circles don't work unless management listens to what the workers recommend. Traditional American management did not allow for that so quality circles failed miserably when the managers tried to copy them without recognizing they would have to change the system. Analysis can tell you what is wrong but it won't help you learn *why* things happen.

Another big problem for analysis is the fact that when you isolate the parts of a system they lose their essential characteristics. If you cut off your leg and put it on a table it can't get up and walk. Consequently looking at the parts of a system in isolation won't help you understand the system. You cannot answer *why* questions using analysis. You must examine an undivided system to understand why things happen as the parts interact while the system is working.

That involves *synthesis* a whole different method of problem solving. With *synthesis* you start with the whole, the design of the larger system in which the problem exists and correct that design to eliminate flaws in the system (Deming called these flaws in the system *common causes*.) Instead of solving problems as is done in analysis where problems can return you *dissolve* problems so they are completely eliminated.

We commit the error of analysis in safety when we isolate and focus on *unsafe acts* as though they caused an accident. You can study an unsafe act as much as you like but you will never really learn *why* it happen. When you isolate an unsafe act it loses its essential characteristic. To understand why an unsafe act happened you must learn how it is related to other parts of the system. Using analysis we have mistakenly identified unsafe acts as the cause of an accident. This would be a logical interpretation by a single event non-systems thinker. They do not view management as a system. But when you use synthesis to examine the whole, unsafe acts are more accurately

classified as symptoms of things not working properly in the management system. They are caused and happen as a result of something else in the system not functioning properly.

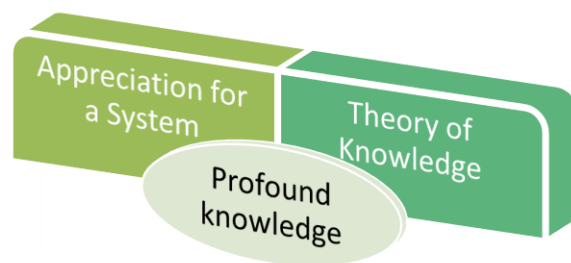
For example managers who work with a *What Do You Think?* attitude understand it requires the help of the workers to examine the effectiveness of safety in any system. They know if you separate and isolate the parts of the system you won't be able to see how things do or do not work together. You have to look at the system intact if you want to discover why a safety problem exists and then dissolve it so it will not return.

In our PPE example *What Do You Think?* managers might start by having a team create a flow chart of the existing PPE program to learn what interactions are taking place. They will seek to obtain a more accurate picture of all of the interactions between the components of the PPE system. It may include the design and effectiveness of training, the quality of learning by workers, the quality and ease of use of PPE by all of the workers, i.e. comfort, size, cleanliness, etc. They will work from the inside out, not the outside in.

Since workers benefit from a well-designed functioning PPE program they will be recognized and treated as the customers. Managing for continual improvement requires the Voice of the Safety Customers (the workers) be matched with the Voice of the System. Doing this will make the PPE program a positive, constructive and effective system. It's the product of the the interactions of the parts of the system that are more likely responsible for why workers are not wearing PPE. That is what the team is seeking to understand and work on. Synthesizing what they have learned about the system with the other parts of profound knowledge will help them dissolve the problem.

Knowledge – theory of learning

To improve a system you must seek to understand why things happen, not just what is wrong with it. For safety this means you must make a prediction about how the system will behave in the future. Will your system run without causing any accidents or near hits? This requires you develop a theory so you can test safety in the system and make changes to improve it. Keep in mind the components of the system interact in many different ways that are not always immediately apparent. In a system cause and effect are not always closely related in time and space. (This bit of information comes from understanding Systems.) That makes diligence about safety even more important.



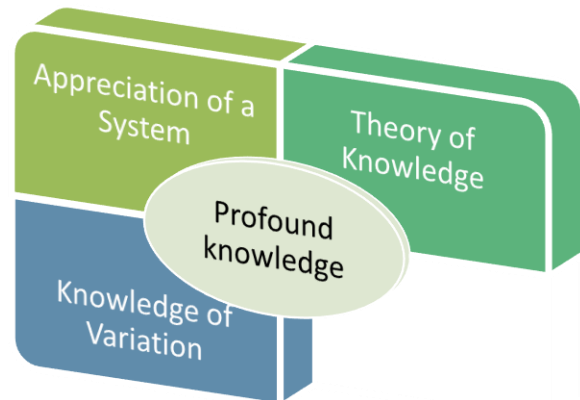
If you try something without using a theory you cannot learn from your experience. You will have nothing to compare the before and after results. Dr. William Shewhart and Dr. W. Edwards Deming gave us a simple yet powerful tool to apply the scientific method to business. It is the Plan, Do, Study and Act cycle (PDSA). By applying the PDSA continually we can gain knowledge and understanding about safety in work systems.

The PDSA provides forgiveness in a learning system. In our example a team of managers and workers would gather data, develop a plan to identify why PPE is not being worn and then develop a theory to make the PPE program more effective. They would execute the plan and study how it is working in operations. Feedback would be taken from the safety customers (the workers) about PPE and any ideas they have to improve it. Changes would be made and tested to keep improving the PPE system. The first idea may not work or make things worse. If things improved expand the solution. If things stayed the same or got worse cycle through the PDSA again. This would be a continual exercise in any *What Do You Think?* safety management system.

Variation – numbers that mean something

Management must learn about variation. Basically no two things are exactly alike. What does it mean for safety? First it means there is no such thing as an average person. For another it means when it comes to a safety procedure what may be right for one person may not be adequate for another.

PPE will not fit everyone the same way. What may be comfortable for one person may be uncomfortable for another. People learn at different rates and in different ways. What does the difference mean? It may mean nothing at all or it may have a definite impact on managing safety in the system. It is important for management to know this and what to do about it. This understanding of variation shared with knowledge of learning will help when making predictions about improving safety in any system.



Suppose in our example 4-7% of people observed were not wearing PPE. Something is obviously wrong. The system isn't working as it was intended. There is too much variation that signifies a lack of statistical control. The system is not capable of delivering what is desired. Too many people are not wearing their PPE. Armed with this understanding management knows it must work on the system not the individual people. Instead of reprimanding employees for what appears to be systemic causes the solution is to form a team and work through a Plan, Do, Study and Act cycle to fix the system. You must learn what kind of variation you are dealing with and react appropriately. Does it come from common causes or special causes?

The *thinking* of statistical process control is vital for understanding variation. Developed by William Shewhart at Bell Labs in the 1920's and 30's and advanced by W. Edwards Deming until his death in 1993, SPC helps people evaluate if a process is stable, on target and how it will perform in the future. In laymen's terms, SPC is the system talking to you. Using SPC you will obtain statistical signals from your process. Used properly it prevents you from making a fundamental basic mistake committed almost daily by *Thou Shalt* managers. That is to treat systemic problems as though individual workers caused them. When this happens management places the blame for problems built into the system on the shoulders of hourly workers who have no control or power to fix the system. This causes workers to lose respect for management.

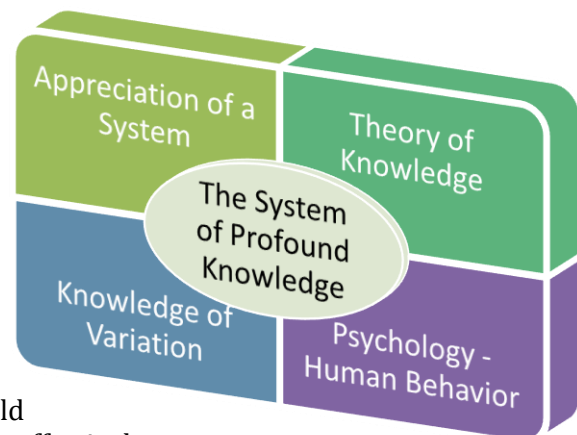
A simple SPC chart can prevent this by telling you with confidence if your process is stable with only common causes driving performance or if any special causes exist in the process. With this information management can take appropriate action to improve things. Without this knowledge *Thou Shalt* managers resort to "management by results." In this world management requires immediate action and an explanation of every single fault, defect, complaint, delay, accident or breakdown. Unfortunately when it comes to safety, managers start with the theory most accidents stem from special causes under the control of the workers. If they do not understand variation and the theory of SPC what else could they do?

If you have a "stable" process confirmed by an SPC chart, i.e. no special causes, then you will know why trying to fix defects by investigating every single one after they have been made is an exercise in futility. A stable system cannot exceed the amount of quality or safety designed into it. When a

process is stable you have to work on the common causes, the interactions of the components of the system to improve the outcomes. Common causes are responsible for of 85-99% of the accidents in the system. This requires an entirely different way of managing safety than *Thou Shalt*.

Psychology – human behavior

Psychology helps us understand the interactions and relationships between people including customers and suppliers. We need to appreciate the human interactions between workers and managers and the management system. Thou Shalt safety management assumes people are all alike and can be managed the same way. There are numerous examples of how safety is delivered as though one size fits all. Knowledge of psychology and variation has taught us people are all different. We all learn in different ways and at different rates. This knowledge alone should impact safety training and how it can be delivered more effectively.



People are affected by extrinsic and intrinsic motivators. Psychology has discovered new exciting things about motivation that contradict outmoded theories applied by Thou Shalt managers. For example we know extrinsic motivators work when the task is simple and straight forward. But if a task calls for even rudimentary cognitive skills rewards can lead to poorer performance and a reduction of interest in the task at hand.³ Yet we continue the use of various forms of incentive programs as basic principles of good safety management. Jobs in today's economy call for people to think about what is going on and apply their mental skills to improve the system. This applies to safety as well as quality. Thou Shalt managers have relied too long on the uncritical application of the pop psychology of *behaviorism* to reinforce that outdated psychological theory.⁴

Intrinsic motivation is a key factor to get people engaged and enthused about their jobs. Managing for continual improvement requires people continually provide manual and mental labor to work on and fix the system. In our example workers feedback about the quality of training on PPE would be solicited. The team would make a concerted effort to engage workers as customers of the PPE program so the interaction between management and workers would result in the dissolving the problem.

Management must learn how to make the interactions between managers, workers and safety in the system a positive, constructive experience. We are not talking about positive re-inforcement here. We're talking about treating people with dignity and respect so they can have pride and joy in their work. When people start working for a company they want to contribute. They do not report to work their first day on the job thinking they would like to make some scrap or be injured. The Thou Shalt safety model often sends a message to workers "Leave your brains in the parking lot because you won't need them here. When it comes to safety, management has done all the thinking for you. All you have to do is comply with the company safety rules and regulations."

There is no room for that line of thinking in continual improvement. Over zealous reliance on enforcement of safety rules and regulations destroys the intrinsic motivation all of us have to do good work and be safe while doing it. Taking advantage of the mental labor available in every single person when it comes to safety instills pride and joy in work and ultimately improves safety in the system.⁵

Conclusion

The *What Do You Think?* approach to safety management strives to give workers ownership of improving safety instead of trying to impose it through *Thou Shalt* brute force management. When people own an idea they are intrinsically motivated to achieve excellence and the safety system becomes self-correcting. Workers hold themselves accountable and cooperate with each other to stress safety constantly and consistently. This eliminates the need for close oversight by management to control the safe behavior of workers. A method that implies a lack of trust where management unintentionally ends up treating employees as though they are children yet expects them to behave as adults.

Profound knowledge provides a system and a lens to view the world of work that creates a new mental model for managing safety. Combining the four parts produces *synergistic* problem solving. It transforms how managers perceive their job and the leadership they provide. It gives new meaning to the interactions between parts, events, numbers, suppliers, customers and people. It will help workers and managers gain a better understanding and ability to manage systems. It allows and encourages people to use their creativity and imagination to dissolve what are insoluble problems for command and control.

Common sense is a good thing. You get it just because you are human and you are alive. It helps solve most basic safety problems. Once you have touched a hot stove you will never have to be told not to do it again. But common sense isn't adequate to solve the complex safety problems that exist even in the simplest systems. Most accidents at work are caused not by the absence of common sense but the lack of interest on the part of management in trying to find out *why* things happen in a system. This means instead of focusing only on things you can see you need to work things not easily observed. You must examine the interactions between people, departments, machinery and equipment, suppliers and customers you can't see but in fact cause most of your safety problems.

You do not have to be a master in one or all four parts of profound knowledge to understand, combine and apply it. Most of us have some levels of profound knowledge from our work experiences and training. You can advance your education about it by reading Chapter 4 of Dr. Deming's book, *The New Economics for Industry, Government and Education*.⁶ Increasing your personal level of profound knowledge will improve your ability to integrate safety in work systems. Profound knowledge will help everyone optimize safety instead of working hard and often failing just to maintain the status quo. It's time for safety management to improve its understanding about *why* accidents happen in work systems. We can start fixing those systems by using the vision and lens of profound knowledge.

To learn more about how you can improve safety in your work systems contact *Thomas A. Smith* at Mocal, Inc. Mr. Smith works with management and hourly employees to help them learn about new theory of safety management to obtain team skills and work on culture change. His book; *System Accidents: Why Americans Are Injured At Work And What Can Be Done About It* has received high praise and can be obtained at Amazon.com. He can be reached at tsmith@mocalinc.com or his company website at www.mocalinc.com or (248) 391-1818.

¹ *Columbia Accident Investigation Board*, August 2003, Chapter 7.

² Deming, W. Edwards, *The New Economics*, 1994, MIT, P. 93

³ Kohn, Alfie, *Punished by Rewards, The Trouble with Gold Stars, Incentive Plans, A's, Praise and Other Bribes*, 1993, p. 123

⁴ Hunt, Morton, *The Story of Psychology*, 1993, p. 279

⁵ Creech, Bill, *The Five Pillars of TQM*, 1994, p 316-17

⁶ *The New Economics*, Chapter 4