Root Cause Analysis – NOT What You Might Think

C. Robert Nelms
Failsafe Network, Inc.
PO Box 119
Montebello, VA 24464
540-377-2010
bobnelms@compuserve.com

Abstract: Loaded with cliché and ambiguity, true root cause analysis is neither being practiced nor even desired in most areas of life. Plenty of organizations are addressing the "physical" causes of failure. Even more seem to enjoy finding out "who did it" so that disciplinary action can occur. But only a few seem willing to dig deeper in an attempt to understand the "root" causes of things that go wrong. Are you one of the few, or are you contributing to the ambiguity?

Introduction: Reflecting on my professional career, I am often amazed to find myself in the position of being able to help define the meaning of "root cause analysis." I am just as amazed that I am only one of many who are trying to define this endeavor. At this point in time, its definition still seems "up for grabs."

In June, 2000 I attended a "Root Cause Conference" near Cleveland, Ohio. Because of the title of the conference, I thought it would be a decisive conference. It had been advertised for over 1 year, but only about 80 persons attended, mostly from the United States. Paper after paper was presented, all addressing the "root causes" of one problem or another. It was remarkable that only ONE of the papers discussed something beyond the physical phenomena involved in the incident.   It turned out to be a METALLURGICAL symposium, NOT a root cause conference. I was disappointed by the apathetic response to the challenges some of us expressed to the flippant use of the term "root cause."

Our society has trivialized the CONCEPT of root cause analysis.   We have become shallow, unwilling to ponder – to dwell on the more elusive questions of life.   Even worse, we increasingly use the words "root cause" to describe our pitiful inquests.

A few weeks after the root cause conference, another experience highlighted the problem. I was working with a group of people in a practice exercise trying to dig into some of the more significant problems in our country. Interestingly, according to this 17 person group (from around the country), one of the most significant challenges the United States faces is a LACK OF UNDERSTANDING of our problems. The group stated 1) we do not know the causes of our societal problems; 2) we don't know which of ALL our problems are most significant and are therefore overwhelmed, not knowing where to start.

Could it be that we have CAUSED this problem by our increasing tendency to be shallow. Even more, are we duping ourselves in thinking that we are DEEP THINKERS by using words such as "root cause" when we are actually only "scratching the surface?"

In a society as complex and convoluted as ours, does it make any sense to trivialize the ONLY pursuit capable of revealing the truth about our problems?

Our Desire to Act Overpowers Our Need to Understand.… *Brad Baker, Conoco, Ponca City OK*

It is necessary to accept the truth about ourselves before we can improve ourselves. In terms of a "root cause pursuit," we ought to acknowledge that none of us has a natural desire to spend time understanding "WHY" when we could be doing something else. Brad Baker, a manager in one of Conoco' largest refineries, summarized human nature in nine jarringly-accurate words (above). Others say it differently.

It takes time to do root cause analysis. We don't have the time.

Do we have to do a root cause analysis on this one – can't we do something based on what we already know?

We've got so much going on already – let's wait to see if we are FORCED to investigate.

We know that it is important to do root cause analysis. But we just cannot do both maintenance AND root cause analysis – it is impossible – there are only 24 hours in a day!

We are so frantically busy with our daily routines that when we finally have a chance to do something worthwhile, all we feel like doing is RESTING!

As part of the leadership team, let me tell you that reliability is only one of MANY initiatives we are being forced to juggle. And it is not even CLOSE to being the number one initiative. With that kind of emphasis, do you really think I am going to devote much time to RCA?

Although these quotes were taken from persons in contemporary industry, they mimic the remainder of our society. We are simply NOT INTERESTED in the "first-rate pursuit." We say it's because we don't have time, but HOW we spend our time is a matter of choice!

Failure Is NOT What You Might Think.

I wonder if any of us understand the true meaning of failure (including myself). If we did, we might treat it differently. Webster's definition depicts a rather distasteful phenomenon.

Failure…1. the state or fact of being lacking or insufficient; falling short. 2. a losing of power or strength; weakening; dying away. 3. a not doing; neglect or omission: as failure to obey rules. 4. a not succeeding in doing or becoming. 5. a person or thing that does not succeed. 6. becoming bankrupt. 7. in education, a) a failing to pass. B) a grade or mark (usually F) indicating a failing to pass.

In contrast to this definition, I ran across a quote a few years ago which I'll probably never forget. Malcomb Muggeridge, the brilliant British journalist (1903-1990) stated:

It is only possible to _succeed_ at _second rate pursuits_ – like becoming a millionaire or prime minister, winning a war, seducing beautiful women, flying through the stratosphere or landing on the moon. _First rate pursuits_ – involving, as they must, trying to understand what life is about and trying to convey that understanding _– inevitably result in a sense of failure_. A Napoleon, a Churchill, a Roosevelt can feel themselves to be successful, but never a Socrates, a Pascal, a Blake. Understanding is for ever unattainable. Therein lies the inevitability of failure in embarking upon its

quest, _which is non-the-less the only one worthy of serious attention_.

If Muggeridge was correct, "failure" is the phenomena we experience when we are on a _first-rate pursuit_. If this is true, failure cannot always be "bad." He also says the only time we can succeed is when we are on a second-rate pursuit. If this is true, _failure is more meaningful than success_ – at least in some cases.

The quote suggests that meeting production goals, building new cars, and seeking a promotion are second-rate goals AT BEST! If Muggeridge were alive, he might laugh and call them third, forth, and fifth-rate pursuits! It made me wonder if trying to understand WHY THINGS GO WRONG is a first-rate pursuit. I think it is (*trying to understand what life is about and trying to convey that understanding*).

But "failure" might be more than even Muggeridge imagined.

Failure is the ONLY phenomena in our existence capable of getting our attention when we are too busy doing other things. NOTHING else can snatch us away from the grasp of our own objectives, desires, and goals and force us to look at the most important facets of life.

If the above statement is true, then failure is the only phenomena in life that FORCES us to look at the MOST IMPORTANT facets of life. Once again, "failure" cannot always be bad!

As I continue to offer consulting and training services, it has become blatantly apparent that the primary reason people don't dig deeper into their failures is that they don't know what "failure" is. The phenomena we call "failure" is NOT what we think it is – it might be the most significant phenomena of life!

The Objective of Root Cause Analysis is NOT What You Might Think.

Most people only use RCA as a "tool" – a means to "solve a problem." But society has been "solving problems" long before the advent of RCA. When presented as a mere problem-solving tool, most people immediately see the effort as "new words for an old thing." Is it? Or is RCA something different?

In the beginning of my career, there was little difference between problem-solving and RCA. I recall one of the major differences; problem-solving did not usually require any expertise beyond what was immediately available. It depended on the knowledge of the collective experience of those dealing with the problem. On the other hand, when we did an "RCA" 20 years ago, we used sophisticated equipment (electron microscopes, vibration monitoring devices, infrared imagery, strain gages, finite element modeling) to help understand the physical failure mechanisms. We also brought-in outside expertise, and shipped broken parts to specialty labs for analysis. Twenty years ago, the difference between typical problem-solving and RCA was related to the extensiveness of testing and use of outside expertise. Back then, "RCA" was only a more sophisticated form of problem-solving.

Recalling the discussion in the previous section, it should be obvious that the objective of RCA could be much more than to merely solve a few problems. If you agree that failure is one of the most significant phenomena of life, you will also agree that its study (through RCA) should also yield something quite significant. Merely identifying the physical failure mechanism is far short of the potential of RCA.

This does not mean that RCA will not solve a problem. Suppose you had an objective of "satisfying your hunger." This is obviously a short-sighted objective (unless you were literally starving to death). A more lofty objective of "achieving good health" would satisfy hunger, and so much more. Such is the case with RCA. It should have a lofty objective.

One of the lofty objectives of RCA could be…

to try to understand what life is about and to try to convey that understanding. (Muggeridge)

…i.e., to help people see the truth about "why things go wrong." In essence, RCA has the ability to change the way people see their existence – as if they were seeing through a distorted set of glasses prior to the RCA, and a somewhat-clarified set of glasses afterwards. It has the potential of changing people's strongest-held belief's attitudes, and assumptions – the very basis of all we think, say, and do.

Much depends on the leader of the investigation. Properly performed, RCA is accomplished with a team of people lead by an experienced principal investigator (PI) who knows what COULD happen if he focuses on a "lofty" objective. When I do an investigation, my own major goal is to ingrain a ROOT CAUSE MENTALITY in my team members – a mentality which they will carry with them after the investigation. Sure we "solve the problem" in the process -- that's why I was hired! But I always have a more "lofty" goal.

A Root Cause Mentality

An insatiable desire to understand why things go wrong, why people do what they do, and how things got into their present state.

A realistic awareness of WHY things go wrong – not just the physical reasons, but the human, latent, and root reasons also.

A Reluctance to Blame – A Desire to Understand

People should leave the investigation saying things like:

From now on I'll always look at evidence!

This stuff even applies off the job!

Now that I see what the "culprit" experienced, I must admit I'd probably have done the same thing!

If the objective of the RCA were merely to "solve" a problem in the fastest manner possible, the PI would gather the most experienced experts in an attempt to quickly identify the physical causes of the incident. In this type of investigation, the emphasis would be on SPEED (and it would NOT be a root cause analysis).

But the emphasis in a true root cause investigation is almost opposite. Often, the PI must assert him/herself to SLOW THINGS DOWN. He knows that:

the process of discovering why something goes wrong is more important than the answers we find.

The slower we go, the more we'll see.

In May, 2000 I was hired to present my normal 4-day training session for one of my clients. Prior to the training, the client requested that I CHANGE some of my emphases. He told me that "we want to use RCA as a TOOL, and ONLY a tool." "In fact," he went on, "we are only going to use it to define the PHYSICAL causes of failure most of the time. Our management wants answers as fast as possible, and will not "buy in" to going further. Every once in a while we might address a system issue – but not often. Most importantly, we don't want to get into this "latency" stuff (attitudes, assumptions, and beliefs). It's too impractical-sounding.

It was an especially-discouraging discussion because I had been working with this client for 5 years, and thought they had bought-in-to the POTENTIAL of root cause analysis. According to the seminar critiques, the hands-on people certainly had!

I resisted their request to change the seminar. Instead, we agreed that management should be present during the sensitive portions of the seminar so that they could make comments when they felt a need.

The response of the class was enlightening. They were aghast at the apparent shortsightedness of their management. They challenged them on-the-spot and at breaks, generating a few HOURS of interesting dialogue.

I walked away from the experience with yet another data point in my mind; that the lofty objective of RCA will not be realized if you wait for management's approval. The vast majority of management is riveted on short-term performance. In support of their objectives, they will only see RCA as a tool to be used to help them "get the process up and running as fast as possible."

*** Although it would be easy to "blame" management for this short-sightedness, it would not be fair. After all, the stock market is what causes the short-sightedness of management -- because most investors (these days) are interested in short-term gains. The real "culprit" is the investors!

In summary, the lofty objectives of RCA are 1) to "understand what life is about, and to convey that understanding," and 2) "to ingrain a root cause mentality within everyone who participates in an RCA." It appears that these lofty objectives will not be realized unless you make it happen (whoever you might be). Just do it!

The Ending Point (Root Cause) Is Not What You Might Think.

I have mentioned "physical, human, and latent causes" several times. The domino theory helps to explain these three levels of causes.

The diagram shows the three levels using a broken motor shaft as an example. It suggests that the PHYSICAL cause of the failed shaft is "fatigue." It also suggests that someone did not align the shaft properly (the HUMAN cause), which resulted in the fatigue failure. Finally, it states that the person did not think he had time to align the shaft properly – a LATENT cause.

The Domino Theory

root cause

latent causes
(not enough time to properly align)

human causes
(misalignment)

physical causes
(fatigue failure)
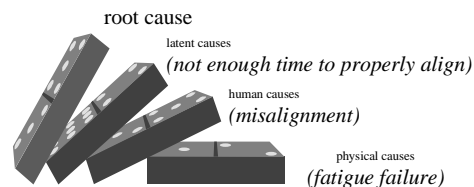
I will discuss ROOT CAUSE later. For now, I will elaborate on latent causes. LATENT causes usually address "attitudes, assumptions, and beliefs," or "what about the way we do business contributed to the HUMAN cause?" In the example above, a maintenance mechanic assumed that he did not have enough time.

Latent causes are generic. They are "carried around" inside of people's "heads." They affect many/all actions – not just the one that caused this particular failure. If the maintenance man in the above example assumed he did not have enough time in this case, he is probably assuming the same thing in other cases, causing inestimable problems.

Interestingly, the failed shaft could be "fixed" by installing AND PROPERLY ALIGNING a new shaft (this is where the "client" in the preceding section wanted to stop most of their investigations). But even if the maintenance man took the time to align THIS shaft THIS time (because of the attention you have placed on

THIS failure), if you haven't done anything about the general ATTITUDE that many other people are "carrying around," many other things will go wrong because the ATTITUDE has not been corrected (this is what the client did NOT want to do – they didn't want to get into "people's attitudes, assumptions, and belief's).

Some people are reluctant to address latent causes because they see it as an interminable quest. At the Root Cause Conference in Cleveland (mentioned in the opening paragraphs), one person summarized it quite well:

If you really want to get to root cause, you'll end up probing a person's personal life, their parents personal lives, their grandparents – all the way back to "Adam and Eve."

Layers and Layers of Latent Causes
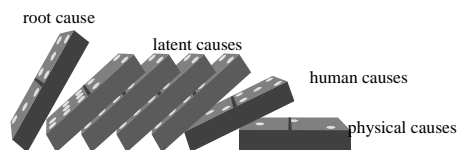
Latent Causes:
What attitudes, beliefs, or assumptions contributed to his action?
What about the way we do business contributed to these attitudes?

This "layering" of causes is what makes "latency" seem impractical. No matter where the investigation stops, it could go deeper (unless we address "Adam").

… Understanding is for ever unattainable... Muggeridge *(from initial quote)*

Therefore, when defining the LATENT causes of a problem we must limit ourselves by addressing "the way we do business" – as opposed to investigating someone's "home-life." While probing for latent causes, the TWO typical questions should be:

1.   *What was the person actually thinking when he made the decision to do the "inappropriate" thing? (attitudes, assumptions, beliefs)*

2.   *What about the way we do business contributed to this thinking? (what helped foster the above attitudes, assumptions, and beliefs)*

(Much instruction is available to demonstrate how to effectively identify and resolve LATENT causes, but is beyond the scope of this paper.)

The concept of LATENCY has more POTENTIAL than any other facet of RCA (as we know it today).

What about the END of the pursuit – the ROOT cause?

I recently came across a book entitled: "Structures, or Why things don't fall down," by J. E. Gordon (the book is rated 5 stars on Amazon.com). In one of Gordon's most candid (and relevant to this discussion) statements, he says:

*It is rather fashionable at present to assume that error is one of those things for which it is not really fair to blame people, who, after all were 'doing their best' or are the victims of their upbringing and environment, or the social system – and so on and so on. **But error shades off into what is now very unpopular to call 'sin.'** In the course of a long professional life spent, or mis-spent, in the study of the strength of materials and structures I have had cause to examine a lot of accidents, many of them fatal. I have been forced to the conclusion that **very few accidents 'happen' in a morally neutral way.** Nine out of ten accidents are caused, not by more or less abstruse technical effect, but **by old-fashioned human sin** – often verging on plain wickedness.*

*Of course, I do not mean the more gilded and juicy sins like deliberate murder, large-scale fraud, or Sex. It is **squalid sins like carelessness, idleness, won't –learn-and-don't-need-to-ask, you-can't-tell-me-anything-about-my-job, pride, jealousy and greed that kill people.***

I quote Gordon because he is much more articulate than I (read his book!!). He goes on, in his succeeding paragraphs to support the following conclusion:

People do not become immune from the classical or theological human weaknesses merely because they are operating in a technical situation, and several of these catastrophes have much the drama and inevitability of a Greek tragedy. It may be that some of our textbooks

ought to have been written by Aeschylus or Sophocles – these writers were not humanists.

My own experience thoroughly supports Gordon's conclusion. I see that ALL true "failure" is caused by our own human condition (sin) as described by Gordon. In the end, WE cause everything that goes wrong.

On page 4, I mentioned a client who <u>only</u> wanted to use RCA as a tool. I also mentioned that the client did not want "to get into latency." Instead, "we want to address our systems. Systems are where our company is placing its emphasis. Our problems can be traced to our systems."

Whereas I strongly <u>agree</u> in the need for adequate systems, I strongly disagree that "systems are the ultimate cause of our problems." Those of us who have been willing to look BEYOND "systems" know better.

What You Will Discover Is NOT What You Might Think.

RCA has changed me. For some reason, I have been willing to "see" what failure has been suggesting over the years – <u>whatever</u> it might show. Perhaps it is because I was not an employee of any of the companies I did business with, and therefore had no had stake in their present way of doing things, or even in their survival. Or perhaps it was the "failures" in my own life which forced me to stop and take heed. Whatever the reason, I am convinced that Root Cause Analysis has the ability to change the way you see our existence, IF you are willing to leave your pre-conceived notions behind.

I do not know what you will learn if you are willing to look, but I can certainly speak for myself. As a result of teaching, debating, writing, coaching, and leading investigations for 30 years, RCA has helped me discover 3 jarring but undeniable (to me) truths:

1. Everything we need to know about our existence is staring us right in the face, if we'd only take time to look.

2. In any given system, the worst possible thing that can go wrong will go wrong – it's just a matter of time.

3. There is such a thing as a "conservation of wretchedness," i.e.:

- Human beings will always try to "get away with something" (similar if not identical to the notion of "sin").

- But our existence is incapable of "absorbing" these acts of "getting away with it."

- Therefore, ANY time we try to "get away with something," something BAD will happen sooner or later (similar to the conservation of energy / cause and effect / action/reaction, etc.).

Conclusion

Root Cause Analysis is not presently yielding what it COULD. Most people are only using it as a tool. They say they don't have time for anything else. But how we spend our time is a matter of CHOICE.

Root Cause Analysis COULD change the way people see their existence, IF the Principal Investigator makes this one of his objectives. Many management teams will not want to give the PI time to identify the LATENT causes of failure, even though they are causing immeasurable additional problems.

Investigations should progress through 3 types of causes; physical, human and latent. Of the 3, latent causes are the most important ones to identify and rectify. They cause ALL failure.

It is vital to be able to leave your pre-conceived notions behind whenever investigating a failure. If you do, you will see some very disturbing but enlightening truths that are bound to change you (and thus your surroundings) for the better.

References

1. Henry David Thoreau, Walden and Other Writings, Bantam Books, 1981

2. Blaise Pascal, Penses, Britannica Great Books, Encyclopedia Britannica, Inc. Chicago, 1952

4. C. Robert Nelms, *Plant Audit* (confidential)

5.   C. Robert Nelms, *What You Can Learn from Things that Go Wrong,* Failsafe Network, Inc., 1992

6.   C. Robert Nelms, *The Dynamics of Inculcating the Root Cause Mentality*, Failsafe Network, Inc, 1993

7.   J.E Gordon, *Structures, or Why things don't fall down*, De Capo, 1988