

Diagnosing and Mitigating Normalization of Deviance for Professional Engineers

An Online Continuing Education Course for Engineers

Course Number: P-3012

Credit: 3 Hours / 3 PDH / 3 CPD

Diagnosing and Mitigating Normalization of Deviance for Professional Engineers

Jeffrey S. Caudill, P.E.

Prologue

Have you ever begun a new job, visited another company location, or joined an organization, and your gut was telling you that something is not right? You notice something amiss, and no one sees it but you. Then, having been in that environment for several weeks or months, it goes away. This process sometimes called acclimating or assimilating, could be normalization of deviance.

If the thing you find amiss is living with a lower standard of safety, ethics, or social acceptance, then you could be in an environment that has normalized its deviance. Diane Vaughan, a sociologist, developed this theory in her internal company research called *Controlling Unlawful Organizational Behavior* (1986). She developed this theory when looking at where conflicts, mistakes, and disasters had **found their roots**. She held that the source of these phenomena lay within the environments in which they occurred.

Like any theory, it remains a theory until it is proven. In 1996, she published a book called *The Challenger Launch Decision*. This book set out to uncover the source of the problems with the 1986 crash. Critically acclaimed, this book caught the attention of many in the Safety and Process Safety fields. In addition, many in the social science field would say that her theory had been proven. Applications of the book to industrial and manufacturing fields quickly sprang up.

The fledgling field of Normalization of Deviance (NOD) has grown over the last few decades, now coming into the mainstream. A recent book by the Center for Chemical Process Safety, CCPS, has defined NOD and its applications to safety within the industrial and manufacturing fields. *Recognizing and Responding to Normalization of Deviance* published in 2018 by WILEY provides a comprehensive look at NOD. The author of this course contributed to this effort as a peer reviewer of the manuscript during its development.

This course will pull from various personal and historical writings and information that is of value for Professional Engineers. Understanding NOD and the factors that contribute to it are a key for Professional Engineers. NOD, like in the *Challenger* disaster, could be a latent defect in your organization or in its processes. NOD can be found in Engineering, Design, Manufacturing, Maintenance, and even Human Resources. It can be rampant in the entire company or reside in a microcosm within a supervised group. Our review will concentrate on NOD's application to the engineering profession.

In the real-world, production and operations can take precedence over Engineering judgment.

How often are Professional Engineers asked to prove a problem will occur that has not happened yet? What do we do when our reputations and pride are put on the line, and we know something is not right, but we are outranked and outnumbered?

Is Normalization of Deviance an excuse, or does it prove that H. W. Heinrich's original domino theory is correct? Vaughan's work coincides with Heinrich's first domino. In his domino theory, environmental and social factors are influencers on a person's decision making at work.

Heinrich's theory pointed to early childhood environmental and social factor influences and Vaughan's to adulthood environmental and social influences. This course is designed to arm the Professional Engineer in diagnosing the Normalization of Deviance and protect them and their employer from contributing to it.

Headlines

The incidents below, with suspected factors attributed to NOD, most likely showed up in a local newspaper or nightly newscast segment. Like many proud Americans, the author, eighteen at the time, saw the Space Shuttle Challenger disintegrate about a minute after it took off on live television from a college classroom. This left a lasting impression. The first book I took time to read in primary school, "*Rockets, Jets, Guided Missiles and Space Ships*" by Jack Coggins and Fletcher Pratt, had predicted in 1951 that Space Shuttles were a future dream. The Coggins and Pratt book imagined decades earlier that space travel on shuttles would come to pass. There were no mentions of NOD in it. However, they never imagined the tragedy and learning curve that it would take to get us there.

*Kansas City Star:
Challenger explodes;
no hope for 7 in
crew. January 28,
1986.*

*Atlanta Business
Chronicle: NTSB
faults pilots, jet's
design in fatal
Gulfstream G-IV
crash. September 9,
2015.*

*New York Times:
Shuttle Breaks up,
7 Dead, February
2nd edition 2003.
(Columbia Space
Shuttle Disaster).*

*New York Times:
165 Feared Dead
from Oil Rig Blast,
July 6, 1988, North
Sea Piper Alpha Oil
Rig Platform.*

*Hull Daily Mail,
United Kingdom,
Twenty-Eight
Confirmed Dead,
Search For Missing
Begins in
Flixborough, June
1974.*

*Washington Times:
Deepwater Horizon
Oil Platform
Explodes. April 20,
2010, Gulf of
Mexico, off coast of
Louisiana 40 miles.*

*Herald-Dispatch:
Louisville KY.
Carbide Plant
Explodes Killing 2,
March 22nd, 2011
edition.*

Far too often, headlines' like these provide a reality check to what our true purpose is as Professional Engineers. Having a focus on what can go wrong from real events points our moral compasses in

the right direction, sharpens our design skills, and ensures we leave no stone unturned when assessing the consequences, frequency, and risk of a design. Our client-company may be our employer; however, our duty is to protect the public and the environment by providing safe management, maintenance, mitigation, and design practices.

No Engineer wishes to wake up and read their local news knowing their company or they themselves could have prevented an incident like those listed in the headlines above. What can we do differently? What are we missing?

Target Audience for this Training Module

Professional Engineers at all company levels will benefit from this course. Why? Understanding how to diagnose Normalization of Deviance and mitigate it is very crucial to the overall safety culture of your business.

Most will still say that NASA is one of the safest and best-run facilities in the world. It is full of the brightest and best minds in Science and Engineering from all around the globe. Yet, disaster struck. Many grappled with how this could happen not once, but twice.

No one expects lightning to strike twice in the same location. However, after studying lightning over the decades, we know that certain objects, buildings, and geographical areas are more prone to lightning strikes. Roy Cleveland Sullivan, a Park Ranger in the Shenandoah National Park, was medically proven to have been struck by lightning seven times and live to tell about it.

So, what does NOD, NASA, and Mr. Sullivan have in common? It is hard to imagine anyone would survive a single lightning strike. Yet, this man survived seven. Born in 1912 and passing in 1983, if you had asked him, “Do you think that you could survive getting struck by lightning seven times?” as a boy, he would have said that you were crazy. If you had asked NASA in January of 2003 if the Columbia would have broken apart in re-entry after fixed their cultural safety issues after the 1986 disaster, they would have said “no way.”

Just like a lightning strike, the Normalization of Deviance can strike even in the best of safety programs. Companies that win awards for process and personnel safety and have stellar performance metrics could be the most susceptible to NOD.

By using lessons for learning from the tragedies above and principles for diagnosing NOD, we can plot a strategy to mitigate NOD. Professional Engineers at each level of the organization can support this effort doing what they do best: question the norm, ask “why” instead of “why not,” and trusting your data and gut instincts that something is amiss.

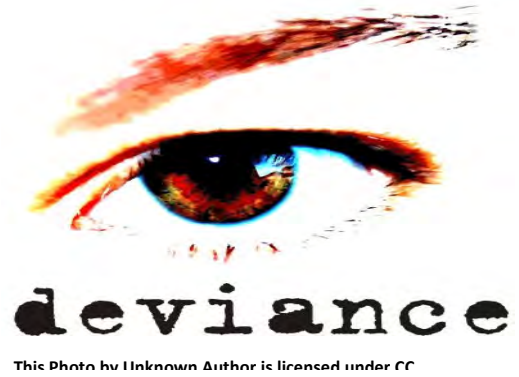
The target audience is at all levels of the organization. It takes engineers at the bottom to recognize NOD and those in positions of power to understand it and have the intestinal fortitude to act. When a Professional Engineer points out a potential fault or flaw, and design or work is stopped, and nothing happens, some begin to question it. It can be a Catch-22: don't speak up, and something bad happens, and you are asked why you did not act on the knowledge or data. That is where the culture of your organization comes in. Similar to a “Stop or Pause Work Authority,” your organization will need to build in legitimate methods to address a major engineering concern.

I urge you each to try this the next time you change jobs or roles from one group, department, or company to another. For the first two weeks, write down any dysfunctional or abnormal systems, policies, functions, or behaviors when safety concerns or engineering design concerns are brought to the attention of your group. They could be brought to leadership or another group as well. Why do this? After you are assimilated into the groupthink, like a BORG on Star Trek, you will become normalized to fit in. Some people, like the author, are not conformers and do not worry about fitting in. You may be like this too, but more often than not, most assimilate. Once this happens, your ability to see NOD diminishes. Just like olfactory sensors in your nose become used to bad smells, your mind will become accustomed to abnormal behavior without even questioning it if you are not careful.

How do you combat this if you have been with your company and department for years? Take two weeks off. Completely unplug from work. Don't think about it, don't read emails, don't call in, just separate. If you can do this when you return, you have a small window to be objective. The best defense against NOD is an army of Professional Engineers that understand it and have the means to point it out and address it.

Defining *Normalization of Deviance*

In researching NOD, you will find as many definitions as there are companies and departments. In order to have it make sense, the wording needs to fit your business model. For example, if you are in real estate, the wording may be applicable to your business, but the meaning will be the same. Similarly, if you are a Professional Engineering consultant that primarily does building design, your wording may be different than that of chemical and process refining engineers.



We do not want you to be burdened or bogged down with exact wording. A quick example is the way to approach this. If you solve a math problem with a specific given formula and variables, then you know how to solve that problem. If you learn to derive the equation for yourself, you have a complete understanding and can usually solve this problem and many variants of it. Approach the NOD definition in the same manner: understand the concept and principle drivers for it, and you can then write a definition that fits your organization.

Lessons for Learning 1: for this step, develop a Normalization of Deviance definition that is specific to your organization and what you do.

When creating a definition, you may say that “it is in the eyes of the beholder” or “I am convinced otherwise.” Environmental, we have regulatory. A good way to see these as roadblocks to creativity versus the normalcy of the field of research and proving it. NOD can exist

Before we define NOD for deviance without human manufacturing processes and failures factors by human factors, failure to perform timely maintenance, and p

To view the remainder of the course material and to take the quiz for PDH credit, you must purchase the course.
Close this window and click “Add to cart” on the product page.

Vaughan’s theory may be a course, you will be safety, Personal Safety, and compliance, both internal and external. An adequate engineer may have been groundbreaking and innovative, and if you work in a field over the work and

that have normalized conditions can occur in errors, omissions, failures, failure to perform

by human factors.