



The Gulf Deepwater Oil Spill - Was Complexity a Factor?

Posted by [Gail the Actuary](#) on May 22, 2010 - 10:29am

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Kurt Cobb in a recent [post](#) raises what is to me a good point: Was **complexity** a major factor in the Deepwater Horizon blowout and oil spill? According to Cobb, the approach is simple:

It is a strategy as old as civilization. Assign each person to do a part of the entire job, and the job will get done faster and better as each member of the work team hones skills and learns tricks to improve his or her performance with each repetition of the task. It's called the division of labor, and as it spreads and intensifies, it leads to greater and greater complexity in society.

But this means that parts of responsibility are assigned to several different contractors, and parts of responsibility are assigned to company employees. And regulators play a role as well, approving many of the major steps in the process.

Within a company like BP, there is also a division of labor. One division of labor relates to different job functions. But there is also a division of labor related to level of experience. An oil company will have quite a few inexperienced employees, plus a relative handful of employees with 30 years of more experience. To try to make up for this lack of experience, the more experienced employees are typically located in a central location, like Houston, and can be consulted in the case of difficult situations. But this takes time, and the step may be overlooked, especially if there seem to be many others involved who also have responsibility and seem to know what they are doing.

When there are many employees and contractors with partial responsibility, it is all too easy for things to slip through the cracks. Part of the problem is that not very many people know the complete story--it is just too complicated. Hopefully, each person knows enough about the situation to make the decisions he or she is supposed to make--but there can be slip-ups. And if there are a lot of different people who have somewhat shared responsibility, there can be the assumption that others will be looking out for problems, so a person doesn't have to be quite as vigilant.

And this division of labor seems to be an issue. Notice that [Art Berman's post yesterday](#) indicates that one of the issues was the well plan BP was working from:

What can be addressed now is the larger issue that a flawed, risky well plan for the MC 252 well was approved by the MMS, and BP, Anadarko and Mitsui management.

As long as everyone else seemed to be looking at what needs to be done, there might have been less concern about really looking at the plan closely, to make certain it is complete enough to detect all problems.

Also, today's Wall Street Journal has an article [BP Tries to Shift Blame to Transocean](#)

The two BP executives read from a part of Transocean's Emergency Response Manual for the rig, emphasizing sections that stated that Transocean's offshore installation manager was "fully responsible" for activities onboard the rig, and BP's representative was there to "assist." "For obvious reasons," the manual said, "only one person can be in charge at any one time."

The manual also said it was the responsibility of Transocean's driller to shut in the well upon detecting an intrusion of oil or natural gas.

In response to BP's claims, Transocean provided The Wall Street Journal with a complete copy of the manual's well-control section. The document suggested the responsibility for decision-making was less clear-cut than what BP highlighted.

The well-control section stated that top managers on the rig for both BP and Transocean were supposed to jointly decide whether the situation was deteriorating to a point where they might lose control of the well. Moreover, while Transocean's top official was atop the chain of command, BP's senior representative was supposed to consult with shore-based management in Houston to "decide appropriate well control procedures" if rig crews had trouble handling a serious problem.

According to [Cobb](#),

The broader question is how such a *system* of oil exploration became subject to such a catastrophic failure.

One answer is that offshore drilling, specifically deepwater drilling, is an exceedingly complex enterprise. And, the more complex an operation is, the greater the chances of a breakdown. Counterintuitively, the safer we try to make such operations, the more the operators of such rigs will likely push the limits of what those rigs are capable of doing and thereby invite additional disasters. (We already know that automobile drivers take more risks as cars and roadways are made safer, something known as the [rebound effect](#).)

Cobb goes on to talk about Joseph Tainter's theory of collapse:

Joseph Tainter, author of [The Collapse of Complex Societies](#), the seminal work on the fall of entire civilizations, explains that increases in complexity in a society are natural responses to challenges to survival. For a time, sometimes a long time, increased

complexity succeeds in aiding the expansion and success of a society. The primary manifestations are the ever greater division of labor (often in the form of additional layers of managers, technical experts and government regulators) and the ever greater technical complexity of the methods and devices deployed.

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But there comes a time, Tainter cautions, when the returns from additional complexity begin to diminish and ultimately turn negative--that is, additional complexity can result in a reduction of resources, safety, security and other measures of societal well-being. When he wrote his book in 1988, Tainter already believed that our global society was experiencing diminishing returns on additional complexity. Might we now be reaching the point where additional complexity brings negative returns?

This additional complexity can bring breakdowns, like the blowout and oil spill. The easiest fixes, like more regulation, are likely counterproductive, if the result is that decision-makers take more risks, assuming someone else is now protecting them from risk.

According to Tainter's theory, it takes additional energy to keep an increasingly complex system going. Let's think about how additional energy might be used in this case to make the system safer:

- Regulators are normally not very high paid individuals. Pay scales could be raised, so that experienced workers from the oil industry can be hired as regulators.
- More experienced people can be hired in the oil field (not certain where they would come from, however) or additional training can be given to company employees, so that company employees know the jobs of independent contractors, and can act as a double check on them.
- Less experienced company people can be tied even more closely with experienced employees. (But even this doesn't help, if the inexperienced person doesn't realize the possibility of a problem, so doesn't check.)
- Company incentives can be changed to reward accident free operation, rather than speed of drilling and completing wells.

All of these changes would be more expensive--that is use more energy, in one way or another, if only to pay employees more. But no one will ever approve approaches that will support the higher-cost system needed to support an increasing complex system. Instead, the lessons from the auto industry will be ignored, and new regulations adopted, which only *seem* to make the industry safer.

The oil industry isn't alone in its complexity. One can think of a lot of other complex industries. For example, the **electrical industry** is terribly complex, especially after deregulation, and the breaking apart of electric utilities into smaller competing parts. Many people assume that the electrical industry is one that people can fall back on, if oil supply is inadequate. Given at least equivalent complexity in the electrical industry, and the unwillingness of governments/regulators to throw lots of energy (\$\$) at offsetting the problems that arise with increasing complexity, it seems to me that the electrical industry is at least as likely as the oil industry to be reaching the limits of complexity. We just haven't been following the electrical industry as closely, so don't understand the situation as well. Perhaps I can run some updated versions of electrical posts that were run earlier, one of these days.



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