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Management Focus

An interview with Karlene Roberts

Interview by
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In this interview, Karlene Roberts, University of California, Berkeley, discusses her research on high reliability organizations (HROs). She defines HROs as organizations that can have catastrophic outcomes but which conduct relatively error free operations over long periods of time and make consistently good decisions that result in high quality and reliability operations. She then discusses major advancements and achievements in this research as well as its limitations and challenges. She talks about surprises the research group faced, progress in terms of organizations becoming more reliable, design principles for such organizations, the necessity for HROs, potential future research efforts and difficulties and obstacles in the research program. Finally, she addresses the issue of whether every organization should be a HRO.

Keywords: High reliability organizations, Organizational systems, Catastrophes

How did the high reliability project come about?

One day while walking back to our offices from a faculty lunch, Professor Todd La Porte (Political Science, University of California, Berkeley) and I began to talk about our mutual interest in the study of ''exotic'' organizations. It turned out we both had contacts with Pacific Gas and Electric Company (PG and E) which operated the Diablo Canyon Nuclear Power Plant in California and he had contacts with the Federal Aviation Administration's (FAA) Air Traffic Control operations. I had contact with the commanding officer of the nuclear powered aircraft carrier, the USS Carl Vinson.

I visited the Vinson while Todd was in Europe and the captain suggested we might have a meeting about common concerns with operating all three organizations. Todd brought a group of people to that meeting from the University of California, PG and E and the FAA and I brought people from PG and E and the Vinson.

At the end of the meeting the captain of the Vinson said that he and his crew knew very well how to operate the ship but that they didn't have time or inclination to write it down. He thought it would be interesting if people like us could document how the Vinson was managed, and suggested that several of us might go to sea on the Vinson. I was the first of the group to go to sea on the Vinson with a Navy captain as my guide. We joined the ship at Yokuska, Japan and left her in Subic Bay, Philippines. Many months later Professor La Porte and Professor Gene Rochlin (Energy and Resources Group, University of California) also joined her. After that a number of researchers rode Vinson and other Nimitz class carriers for about five years.

During those at sea periods and in conversations with the ship's crew on land we came to understand how Vinson operated and that she had a number of things in common with the other two organizations. These things had to do with how the organizations engaged in processes to ensure safe and reliable operations in situations fraught with potential risk. We searched for many months for a label for this project and asked our outside consultants (Professor Charles Perrow, Yale University; Professor W. Richard Scott, Stanford University; and Professor Karl Weick, University of Michigan) to help us in this search. Ultimately the phrase High Reliability Organizations project ''stuck.''

What is a high reliability organization?

Recently I've been using the definition that it is an organization in which errors can have catastrophic outcomes, but which conducts relatively error free operations over a long period of time, making consistently good decisions, resulting in high quality and reliability operations.

Today, for you, what are the main advances of this research effort?

The main advances are that the research identified organizational processes thought to be associated with reliability enhancement in organizations. One of the major early findings was that HROs often structure themselves fairly hierarchically when nothing much is going on. As their environments become uncertain or their tasks become more complex they move to more fluid structures that allow decisions to move ever lower in the organization or to whoever is closest to the operational situation. They also engage in constrained improvisation.

Another major finding is that organizational members develop parts of the picture of the total necessary activities and processes of the organization. When the organization operates well these disparate pictures become amalgamated into a total picture of the organization, its processes and needs. When the total picture fails to emerge the organization is subject to failure.

What are its main achievements?

The major achievement of the work is its application. Most organizational researchers don't care whether their findings are applied in organizations. This research has been applied in real world organizations. In addition, much of the writing about HROs is done by people who have never been in one. We felt that it was important that we spend time in them to try to understand the processes they used to maintain reliability.

Consequently, where do you see its limitations and challenges?

A major limitation is that since we're dealing with infrequent events and difficult measurement problems, we don't have good information as to whether HRO processes reduce catastrophic outcomes. I know of only two organizations that have clearly shown an association between HRO processes and reduced error. One is a pediatric intensive care unit and the other is US Navy aircraft carrier aviation.

Another limitation is that the work is primarily a case study and this needs to be accompanied by other methodologies. Probabilistic risk assessment approaches to these issues are inconsistent with other methodologies and these approaches need to be integrated.

A limitation and a challenge is that we still know very little about the full range of processes that either reduce or mitigate organizational risk. We need to learn about the underlying learning processes that occur as organizations become more reliable. We've examined organizations that are or aren't highly reliable. We haven't examined the mechanisms they used to become more reliable.

From the early design of the research program, what in retrospect appears to have been well anticipated by the group? What are the things you didn't expect?

I'd say we were well aware of the entrée difficulties in such organizations. We invested a large number of resources in developing trust with our organizations. We were also aware of the tremendous difficulties in doing field research of this sort. Because of the length of time required to address these problems for the first several years we did not include graduate students in the work.

I don't think we expected to be immersed in the kinds of very intense operations we found ourselves in. In such situations it is initially very difficult to unpack organizational processes and the learning curve is quite long. We were also unaware of the time constraints within which people often have to do their jobs. Many of the situations we're interested in require immediate attention. For example, when a child's health deteriorates in a pediatric intensive care unit something must be done immediately. Aircraft are catapulted from and recovered on aircraft carrier decks in 48–60 second intervals. Wildfires will quickly get out of hand if not dealt with immediately.

Looking back at your experience, consulting with and doing research in many different organizations, do you see any progress on the issue of organizational reliability?

More organizations are paying attention to the larger issues of process reliability. When we first began the work organizations in charge of accident investigations focused almost solely on the operator who ''caused'' the accident. The US National Transportation Board investigated transportation accidents by trying to find the culprit. US Navy aviation investigators rarely looked beyond the skin of the aircraft for

the source of the accident. The objective was to name, blame, and either train or fire the worker.

In our research we've seen almost no single point failures meaning that large scale accidents are rarely caused by one person. They are a part of the organization to which operators belong. Thus, one would want to know such things as whether group norms contributed to a mishap, whether the goals of the organization are consistent with reliability enhancement, or whether assigned tasks are doable in a safe manner. One would also want to know about external contributors to accidents. Cultural norms, regulators, etc., can impose on organizations behaviors that are inherently unsafe.

An example of the requirement of organizational resources for man-made catastrophes to occur is 9/11. In this situation Al Qaeda used the resources of two very large organizations to demolish three additional organizational composites.

The design principles that can be inferred from the HRO perspective contradict some of the widely admitted management principles (e.g. redundancy). How do you argue about this with managers in business organizations?

We try to show managers instances of high and low reliability performance and address with them the processes involved in both. For example, when organizations are under scrutiny for cost control often the first two things to go are slack (which allows for redundancy) and training. Both contribute to reliability enhancement. We also try to show other processes that are or are not in place that we think are associated with high or low reliability operations. For example the American fiasco at Abu Ghraib prison is a good example of a low reliability organization. If the press is correct, in that situation the authority structure and goals were unclear, training was non existent, and the force was not adequate to the task.

Often managers don't believe that they need to loosen structures in organizations in which error can have catastrophic outcomes rather than tighten them down. Looser structuring allows people to openly communicate and problem solve with one another. An example of this is a series of accidents suffered by Korean Airlines. A team of American aviators consulted with KAL and pointed out to them that they were tightly structured in the cockpit and that their norms were such that first officers felt they could not question the activities of the captain. That reduced to zero one channel from which the captain could get information.

The other thing we try to alert managers to is the fact that catastrophes are not caused by bad people doing bad things (an exception being 9/11). People usually try to do what's right for their organization. An example is the sinking of the Japanese fishing boat, the Ehime Maru, by the nuclear powered submarine the USS Greeneville. There is no evidence that the captain of the Greeneville, Scott Waddle, or any of his men wanted to do anything but the right thing for the ship, its visitors, and the US Navy.

Do you know organizations which are doing good things or trying to meet the challenge?

We and others like us try to work with organizations that want to become more reliable. Several authors (i.e. Robert Pool in *Beyond Engineering*, Howard McCurdy in *Inside NASA*) comment on the probable necessity for more high reliability organizations in the future. Their argument is that we're building more complicated technologies and our ability to manage rather than to conceive or build them may become the limiting factor.

The organizations we know of that are trying to become more reliable are far ranging and include industries such as healthcare, weapons manufacturing, banking, community emergency services (fire and policing), chemical production, oil refining, military operations, railroads, commercial aviation, and maritime operations. Some of these organizations require complex technologies and some don't.

We should not suppose that because an organization or an industry is highly reliable at time one it will be highly reliable at time two. Reliability enhancement requires constant attention, is expensive, and is very fragile. This is one reason organizations fail to engage it.

Where should the efforts be focused today?

We think research efforts should be focused on the places where parts of organizations come together because we think many errors occur at these ''interstices.'' An interstice can be any place parts must work together. These include shift changes, relationships between hospital pharmacies and wards, the relationship of organizations with their contractors, the relationships among geographically separate parts of organizations, etc. An example of the latter form of relationship is NASA in which the geographically disparate centers often behave like rival universities, each with its own traditions, interests, products, advisors, etc.

The application efforts should be to educate top management about the absolute necessity of reliability enhancement in many circumstances. Often the cost of accident recovery far outweighs the cost of prevention. Examples of this are the Chernobyl nuclear power plant and the pesticide plant at Bhopal. We

hardly need the environmental damage caused by the Exxon Valdez or the Petrobras oil platform, or the loss of life and the Scandinavian maritime concerns over the sinking of the Russian submarine, Kursk.

What are the main difficulties and obstacles?

Money. Management philosophies that make it acceptable to cut corners. Cultures of ''not in my back yard'' (NIMBY) or ''not on my watch'' in which managers and other in organizations say, ''well it just won't happen here.''

As a researcher, what constitutes your best experience working on those issues in an organization?

My best experiences come when I think the research findings and applications have contributed to people's safety and security in organizations or their environments. We know of a sub acute medical facility for children ages zero to twenty two that implemented a high reliability program. Before its implementation one child on the unit was diagnosed as vegetative. She is now reading at the fourth grade level. While I don't have certain evidence that HRO caused this, the before-after experience surely suggests some contribution. We also know of a large multi hospital application of HRO principles in its neonatal units. The hospital has evidence that work is more effective on these units and they report anecdotal evidence from care givers that they are saving lives.

Apart from industries where safety and reliability issues are obvious, do you think that managers in business organizations have a clear picture of the hazards that may jeopardize their organization and other people? How would you describe their state of mind about this?

Often they don't. And the further the risk is away from top management's offices the more they are likely to ignore it. In a recent study some of my colleagues found that hospital workers thought their organizations were less safe than US Navy aviators thought their organizations were and top management in both situations thought they were safer than people nearer to where the rubber hits the road. The further one is from the core of an organization the less its management is likely to be concerned about its risk potential. Valu Jet is an example of this. This airline contracted out its cargo loading operation. The company and contractor were probably unaware that the loading of oxygen canisters into the hold of an aircraft might be dangerous. Nevertheless, Valu Jet was responsible for lost lives when the canisters blew up. Contractors are increasingly used by organizations which lack control over them. And yet there is no good evidence that contracting out is cheaper than doing the job at home.

Business organizations are not military aircraft carriers. But some scholars in management argue that HROs can teach managers useful management practices even when hazard issues are not at stake. In short: all organizations should be more or less HROs. What do you think about this idea?

I've heard this and tend to agree with it. But, then, I'm like the child who found the hammer and now has to hammer everything. I suppose if one manufactures or sells a product which can harm no one, even in conjunction with other products, one would be foolish to put many resources into reliability enhancement. But much of what we do in a modern world doesn't fall in that category. Take even the simplest, technologically less developed activities we engage in. One would hardly like to see the local water system poisoned.

Are we doomed?

If you believe Charles Perrow's book, *Normal Accidents*, we probably are. Perrow says some technolo-

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gies are so dangerous they should be done away with all together. He specifically names nuclear weapons and nuclear power plants. I agree with the point that we should eliminate dangerous technologies. But the fact of the matter is no one's going to do that. Reliance on risky technologies is a fact of life. Our position is that since this is a given we must do all we can to increase reliability in such technologies.