

Lecture Notes: Disaster Vulnerability and Resilience

Session 11

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Organizing for High Reliability: The Role of Reflective Practice

Intro:

Work focuses on decision-making at individual and group level.

- I. Goal:
 - a. Provide a tasting menu for “Organizing for High Reliability”
 - b. Determine how we create resilience in organizations through
 - i. Prevention and
 - ii. Response.

Organizing for High Reliability

- II. General Concepts
 - a. High Hazard Organizations: small mistakes can have a ripple effect that causes a large effect downstream
 - i. Perrow: If an organization has high complexity and tight coupling (i.e. every action – or inaction – has an immediate effect on other processes)
 - b. High-Reliability Organizations: organizations that produce products AND produce safety
 - i. James Reason: Swiss cheese model
 1. Organization with bad and hazardous activities happening, must prevent accidents
 2. Prevent accidents through defenses:
 - a. Redundant systems checking for failures
 - b. Defenses are complex, make things more opaque
 - i. E.g. car systems computerized.
 - ii. Small problems can sneak through (holes in the cheese)
 3. Perrow is very cynical about High-hazard organizations, does not believe that accidents are preventable.
- III. Applications
 - a. Learning from accident and error in
 - i. Nuclear Power – Chernobyl:
 1. Workers turned off multiple defense systems to check one
 - ii. Jurassic Park
 1. One person turned off electricity to fence system, the person fell, never came back to turn them on again
 - iii. Chemical Processing: \$16 M explosion: an empirical example
 1. System to remove coke (coal dust) from inside of charge heater firing tubes (the system that heats the petrochemicals)

to refine them) had changed, new process was never checked (coke built up more quickly than expected)

2. Maintenance changed de-coking process but hadn't told those in charge of checking how much coke was accumulating in the stacks.
3. Pressure to increase production resulted in a decision made to increase the heat in the firing process. This meant that the hottest point on the charge heater tubes moved up in height and this higher level was not monitored by the thermocoupling device. Checking did not account for the change.

IV. The Quality of "Soft" Defenses

- a. Defenses are generally thought of as hard objects (e.g. bike helmet is a defense between your head and the hard road, should you fall). But defenses can also be "soft" like thought processes or double checking.
- b. Threat-rigidity Response
 - i. Restriction in information processing
 1. Peripheral vision retracts
 2. Sensory apparatus declines in its broadness
 3. Activation of knowledge structures may decrease
 - ii. Regression to well-learned responses
 1. This means that people retreat to reactions like "fight or flight" things that are strongly ingrained.
 2. These responses are a key part of our "soft" defenses
- c. Automatic problem-solving responses:
 - i. Aviation: "Command and Control"
 1. A number of crashes occurred in the US in the 1970s because second-in-command was not able to speak up in a way that alerted the captain to the problem and the captain could not ask questions and listen in a way that allowed him to hear what the first officer was saying. Influence of military command and control culture.
 2. Industry started "Cockpit Resource Management"
 - a. Has trained people to talk up the authority gradient
- d. Organizational bases:
 - i. Behavior in stressful situations illuminates professional training and more subtle socialization within the profession.

V. "Reflective Practice" as a source of Resilience

- a. Example: Conflict with an Authority Figure:
 - i. If the only defense is retreat and not speaking up, it is not a very strong defense, not resilient
 - ii. If repertoire of defenses includes multiple choices, the defense is much more resilient.
- b. Donald Schon: *The Reflective Practitioner*

- i. City planners argue with peers and clients and do not get anywhere; Schon asked, Why is this happening? What are they trying to accomplish?
 - ii. Premise: professionals need to understand the rules that are guiding our behavior in order to improve them and get better results in work
 - iii. Basis: Ladder of Inference (how we make leaps of abstraction):
 - 1. Utterances
 - 2. Select and Name Data
 - 3. Inferences: These are often mistaken for fact. In reflective practice, this slows down and the leap from fact to inference is examined.
 - 4. Frames
 - iv. Frames and Inferences:
 - 1. Tacit assumptions (“frames”) guide behavior
 - 2. Frames definition:
 - a. If-then rules based on pre-existing beliefs
 - 3. Inferences definition:
 - a. Conclusions we draw based on data
 - 4. We are unaware of these assumptions, or “frames”
 - v. Applications:
 - 1. Reflective practice work groups
 - 2. High-fidelity simulations
 - a. Allows people to analyze their thinking in simulated situations that closely mimic situations they might face in real life
 - 3. *Action Research Journal* (Sage Publications):
 - a. Provides a forum for articles on reflective practice.
- VI. Case Study: Diagnostic Error and Ingenuity in Operating Room Crises:
- a. How do doctors do diagnostic problem-solving when they don’t know what is wrong?
 - b. Goals:
 - i. Describe automatic problem-solving responses in a medical crisis:
 - 1. Gives information about how doctors are trained and socialized
 - ii. What are characteristics and consequences of different problem solving modes?
 - c. Project Description
 - i. Site: The Center for Medical Simulation (run by a nearby medical school).
 - ii. Patient: computer controlled mannequin with heart sounds, breathing indicators, voiced by computer in a separate room.
 - iii. 39 people in the study, each confronted the same medical crisis.
 - 1. Third-year anesthesiology residents in training.
 - d. Data Sources:
 - i. Videos and transcripts

- ii. Post-simulation debriefing summaries: students explain what they were thinking, why they made certain decisions
- e. Data Analysis:
 - i. Process Tracing
 - ii. Qualitative Data Analysis:
 - 1. Inferences of internal processes based on external traces
- f. Measures:
 - i. Categorized problem solving practices by patterns based on
 - 1. Frames:
 - a. Problem Setting:
 - i. What problem have they set themselves?
 - b. Problem Evolution:
 - i. How has their assessment of the problem change?
 - 2. Talk:
 - a. How do students talk?
 - i. Advocacy:
 - 1. We talk in ways that make people think our inference is reality
 - 2. We make statements that mistake our view of reality for reality.
 - ii. Inquiry:
 - 1. Those who believe their view of reality is contingent, ask more questions.
 - 3. Action:
 - a. What diagnostic tests do they use?
- g. Problem Solving Categories:
 - i. Fixation: Choose one diagnosis and stick to it despite mounting evidence against it
 - ii. Diagnostic Vagabonding: Jump from diagnosis to diagnosis without extensive treatments or tests to see whether you are on the right track
 - iii. Balanced Problem Solving: Tended to be the only people who solved the medical crisis: persisted a lot (like fixated) and explored a lot (like vagabonds).
 - iv. Deer-in-the-headlights: Stalled. Cannot generate diagnoses, can't do treatments.
 - v. Focus for today:
 - 1. Fixated and Balanced
- h. Clinical Problem:
 - i. Doctor comes in, breathing tube is inserted, patient is not able to ventilate properly.
 - 1. Obvious diagnosis = bronchospasm (asthma attack)
 - ii. The actual problem is that the patient exhaled mucus into the breathing tube, which hardened and blocked the passageway

- i. Profile of Fixation (N=11):
 - i. Frame: Problem Setting and Evolution
 - 1. The problem: resolving the known diagnosis
 - 2. Diagnostic lens invisible to clinician
 - 3. Frame = Reality; or my view is complete
 - ii. Talk: Advocacy and Inquiry
 - 1. Advocate, don't inquire, don't invite input
 - iii. Action: Diagnostic Tests
 - 1. Perfunctory and/or no diagnostic tests
- j. Profile of Balance Problem Solvers (N=9)
 - i. Problem Setting and Evolution:
 - 1. Find the diagnosis that convincingly solves the ventilation problem
 - a. Half: Treat the known (but erroneous) diagnosis, then serially rule out diagnoses.
 - i. Start out looking like Fixators, but they methodically rule out the original diagnosis.
 - b. Half: Immediately consider 2 or more diagnoses
 - 2. Aware of Diagnostic frames
 - 3. They have diagnoses, the diagnoses don't have them.
 - ii. Talk:
 - 1. Describe own diagnostic thinking and inquire
 - 2. Advocate and pair with action inquiries
 - iii. Action: Diagnostic Tests
- k. Implications for Crisis Management:
 - i. Automatic reaction of advanced residents at a top medical school is not good enough 77% of the time.
 - ii. Basic diagnostic hypothesis testing is *not* second nature
 - iii. Developing skill in intra- and interpersonal inquiry moves in problem solving is not a "touchy-feely" luxury but important to maintaining safely and avoiding errors.

Case Analysis

- VII. Using the Reflective Process Model:
 - a. Data from Case Study = The general pool of "Utterances"
 - b. Select and Name Data
 - c. Draw Inferences from Data
 - i. Put data selected together with pre-existing frame
- VIII. Evaluating the Case:
 - a. Steve makes the inference:
 - i. The caller is rude
 - b. How did Steve get there:
 - i. Data: Caller didn't say hello or identify themselves
 - 1. What data does he select: "Where are you and your ever-loving watching the game" (the lack of hello)

2. Be really picky – identify any data that the case writer ignored
- ii. What inference does he draw? (left-hand column):
 1. She's rude
 2. The term 'ever-loving' is mocking their relationship
 3. She's nosy.
- iii. Frame: People who don't say hello and identify themselves are rude
 1. To set frame, outsiders must make inferences:
 - a. What pre-existing belief does Steve hold that shapes his inference?:
 - i. Polite people start with a greeting;
 - ii. Mother-in-laws are problematic;
 - iii. People who don't say hello are presumptuous;
- c. Alternate inferences:
 - i. People who know me well don't have to say hello
 - ii. She is in a hurry

IX. Case Analysis Method:

- a. For first-round analysis and action...
 - i. The focus is on the CASE WRITER (no matter how annoying, corrupt, or wrong the other person in the case appears).
- b. Map the data, inferences and frames of the case writer
 - i. Data (bottom of sheet) = what was said
 - ii. Inference (left / middle of sheet) = case writer's interpretation of the data
 - iii. Frame (upper left corner of the sheet) = pre-existing beliefs or rules that shape the inferences
 - iv. What new frames and inferences might help the case writer be more effective?