PubPol 587-001: Organizational Causes of Largescale Technology Failure

(Revised 8/1/21)

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Instructor office hours:
Monday 3-4 (ZOOM) and by appointment

This course is designed as an online synchronous experience, with Zoom class sessions once a week at the normally scheduled time. I have taken special effort to find ways of helping you be fully engaged with the course materials and with each other. Thanks to the varied tools for interaction provided by Zoom, I believe we can count on an excellent and engaged learning experience. We will make use of breakout rooms, shared graphics, and student presentations throughout the semester. Zoom sessions will be recorded so students who cannot participate synchronously can view the session online.

Course description

Gas plants explode, planes crash, and nuclear power plants suffer meltdowns. Human beings make mistakes and complex technologies fail in unexpected ways. Often unrecognized in accidents and disasters are the organizational features that made these disasters possible or likely. This course examines the organizational features, system defects, and bureaucratic dysfunctions that contribute to large technology failures. Organizations affect the occurrence of accidents at every level. Internal characteristics like poor communication, loose coupling, and principal-agent problems lead to accidents. External factors like ineffective regulation and enforcement likewise contributes to disaster. Through case studies, sociological analysis, and organizational study this course will help students think more fully about safety and accident in our technologically complex world.

Learning will occur through study of detailed real-world case studies as well as social-scientific analysis of the workings of various organizations and agencies. Teams of students will take on a particular accident or failure in order to analyze the incident; identify causes and dysfunctions; and recommend remedies for reducing risk through public policy and corporate organizational change. Examples may include: Katrina disaster relief process, 2011 Mississippi River flooding, the Morandi Bridge collapse in Genoa, Fermi I meltdown, Davis-Besse nuclear power plant near-miss, New England Compounding Center meningitis contamination case, the Boeing 737 Max, and sexual predation scandals at Penn State or MSU.

Assignments

Work in the course is organized around a group project developing a case study of a significant event and an individual policy brief based on a different case. Team members will collaborate in development of a case-study treatment of the event, including organizational, technical, regulatory, and external factors. The case study will make recommendations for organizational policies and changes that would serve to reduce risk, including both internal policies and public policies when appropriate. Teams will make 20-minute presentations during class in the final eight weeks of the semester. The work product from the team project should be a jointly-authored case report and a slide presentation suitable for a 20-minute presentation of the essentials of the final findings, including policy recommendations based on the case. Each student will write a reflective individual policy brief of about 2,000 words on the case you studied in your group project. This will not require additional research but will expect you to make use of the learning you have done from the readings and discussions of the course to write your own assessment of causes and "lessons learned" from the case on which you collaborated.

Grades will be assigned according to the following weights: asynchronous participation on Canvas discussions (20%), group case study slide presentation (20%), group case study case report (35%), and individual reflective brief on group case study (25%). The group case study components will receive a single grade, which will be shared by all team members.

It is expected that every student will participate in Zoom discussions and in online discussion topics on Canvas.

Course Objectives

- deepen understanding of organizational dysfunction in large organizations
- examine regulatory regimes in nuclear, chemical, and food industries; identify goals and shortcomings
- gain facility in policy analysis with respect to the management and regulation of large technologies
- gain experience working on multi-disciplinary research team

Required books

Charles Perrow, *Normal Accidents*
Little, *A New Social Ontology of Government*
Diane Vaughan, *The Challenger Launch Decision*
Weick and Sutcliffe, *Managing the Unexpected*

Course assignments

August 30
Introduction to the problem: organizational and regulatory causes of large failure
Discussion of case-study projects
VIDEO: *Anatomy of a Disaster* Texas City refinery explosion (YouTube 55 mins) (link)

September 6
Labor Day holiday

September 13
Organizational causes of accidents: Normal accidents
Perrow, *Normal Accidents* (intro, chaps. 1-3,5)
Hopkins, "Lessons from Esso's Gas Plant Explosion at Longford" (PDF)

September 20
Normalization of deviance
Case: Challenger Space Shuttle disaster
Diane Vaughan, *The Challenger Launch Decision* (preface to 2016 edition; chapters 1-6)
Selections from Allan McDonald, *Truth, Lies, and O-Rings* (PDF)
Selections from Rogers Commission report on Challenger disaster, Chapter V (PDF)

September 27
High reliability organizations
Case: Safety of high-risk technologies
Sagan, *The Limits of Safety* (all)
Pereira, "A System-Theoretic Hazard Analysis Methodology for a Non-advocate Safety Assessment of the Ballistic Missile Defense System" (PDF)

October 4
System safety: the engineering approach
Nancy Leveson, "The Role of Software in Spacecraft Accidents" (PDF)
Nancy Leveson, "Technical and Managerial Factors in the NASA Challenger and Columbia Losses: Looking Forward to the Future" (PDF)
Bonaca and Powers, "Safety Culture in the Nuclear Industry" (PDF)
Resource: Nancy Leveson, *System Safety Engineering: Back to the Future* (PDF)

October 11
Managing the unexpected
Weick and Sutcliffe, *Managing the Unexpected* (all)
Case: Esso Gas Plant explosion, Longford, Australia, 1998
VIDEO: Longford Gas plant, Andrew Hopkins, *Lesson from Longford* (link)
(Here is the causal diagram Hopkins discusses in the video; link.)
Hopkins, "Management Walk-Arounds: Lessons from the Gulf of Mexico Oil Well Blowout" (PDF)

October 18
FALL STUDY BREAK

October 25
Case: Fukushima nuclear disaster
World Nuclear Association Fukushima Report (web)
Charles Perrow, "Fukushima and the inevitability of accidents" (PDF)
Charles Perrow, "Five Assessments of the Fukushima Disaster" (Bulletin of the Atomic Scientists 3/10/14) (PDF)
Lochbaum's testimony on "lessons learned from Fukushima" (Union of Concerned Scientists) (https://youtu.be/7FBmfseoKeg)
RESOURCE Lochbaum et al, *Fukushima: The Story of a Nuclear Disaster*

November 1
The sources of dysfunction in organizations and government
D. Little, *A New Social Ontology of Government* (chaps. 1, 6) (PDF)
GAO Study of Davis-Besse Nuclear Reactor Incident (PDF)
Charles Perrow, "Cracks in the "Regulatory State" (PDF)
RESOURCE Walker and Wellock, *A Short History of Nuclear Regulation, 1946-2009* (PDF)

November 8
Regulatory agencies and safety
D. Little, *A New Social Ontology of Government* (chaps. 8, 9) (PDF)
Clarke and Perrow, "Prosaic Organizational Failure" (PDF)
Hopkins, "Explaining Safety Case Regulation"
VIDEO Little, Accident analysis of Boeing 737 Max
RESOURCE Vaughan, D. "The Dark Side of Organization: Mistakes, Misconduct, and Disaster" (PDF)
GROUP 1 PROJECT PRESENTATION
GROUP 2 PROJECT PRESENTATION

November 15
Organizational failures: Patterns of sexual and gender harassment and misconduct
NASEM Report on Sexual and Gender Harassment (PDF)
David Hess, "Corporate Culture and Corporate Compliance Programs" (PDF)
GROUP 3 PROJECT PRESENTATION
GROUP 4 PROJECT PRESENTATION

November 22
Patient and hospital safety
National Academy of Science, Engineering and Medicine, *To Err is Human: Building a Safer Health System*
NASEM_to err is human_exec summary.pdf
NASEM_to err is human_chap 3.pdf
Nancy Leveson, "A Systems Approach to Analyzing and Preventing Hospital Adverse Events"
leveson_systems approach hospital adverse events.pdf

James Bagian, "Patient safety: lessons learned"
bagian_patient safety.pdf
James Bagian, “RCA2: Improving Root Cause Analyses and Actions to Prevent Harm” (PDF)
GROUP 5 PROJECT PRESENTATION
GROUP 6 PROJECT PRESENTATION

November 29
Reforming police departments – racial profiling and excessive use of force
Human Rights Watch, “A Roadmap for Reform”
Brookings, “A Better Path Forward”
Klemko, “Why Police Reform is Hard”
Alpert, “Police Use of Force: Organizational Characteristics”
Bell, “Police Reform”
GROUP 7 PROJECT PRESENTATION
GROUP 8 PROJECT PRESENTATION

December 6
Assessment of Normal Accident theory, HRO theory, regulatory failure theory
Nancy Leveson, “Moving beyond normal accidents and high-reliability organizations” (PDF)
Joseph Stiglitz, “Regulation and Failure”
Brookings Report on Delegated Regulation re Boeing 737 Max
Perrow, *Normal Accidents* (chapter 9)
GROUP 9 PROJECT PRESENTATION

December 6
Group presentation PowerPoints for group projects due

December 10
Project case study reports due

December 14
Final individual papers due

FORD SCHOOL OF PUBLIC POLICY INCLUSIVITY STATEMENT

Members of the Ford School community represent a rich variety of backgrounds and perspectives. We are committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value one another's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in Ford classes and across the UM community

Accommodations for Students with Disabilities: If you believe you need an accommodation for a disability, please let your instructor know at your earliest convenience. Some aspects of courses may be modified to facilitate your participation and progress. As soon as you make your instructor aware of your needs, they can work with the Services for Students with Disabilities (SSD) office to help determine appropriate academic accommodations. Any information you provide will be treated as private and confidential.

Student Mental Health and Well-Being Resources: The University of Michigan is committed to advancing the mental health and wellbeing of its students. We acknowledge that a variety of issues, such as strained relationships, increased anxiety, alcohol/drug problems, and depression, directly impacts students' academic performance. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) and/or University Health Service (UHS). For a listing of other mental health resources available on and off campus, visit: http://umich.edu/~mhealth/

Please review additional information and policies regarding academic expectations and resources at the Ford School of Public Policy at this link:

http://fordschool.umich.edu/academics/expectations

SEXUAL MISCONDUCT POLICY

Title IX prohibits discrimination on the basis of sex, which includes sexual misconduct — including harassment, domestic and dating violence, sexual assault, and stalking.

We understand that sexual violence can undermine students' academic success and we encourage anyone dealing with sexual misconduct to talk to someone about their experience, so they can get the support they need. Confidential support and academic advocacy can be found with the Sexual Assault Prevention and Awareness Center (SAPAC) on their 24-hour crisis line, 734.936.3333 and at sapac.umich.edu.

Alleged violations can be non-confidentially reported to the Office for Institutional Equity (OIE) at institutional.equity@umich.edu