

TWO

WHEN RELIABILITY IS MESS MANAGEMENT

From initial media reports you would think that it was the *unreliability* of mortgage holders and lenders, computer models and trading, rating agencies and investors, along with banks, bailouts, and our animal spirits, that accounted for the financial mess. But that argument was quickly turned on its head: The real culprit was reliability.

“Financial stability itself creates confidence and risk-taking, eventually leading to recklessness and instability,” declared the *Economist* (Carr 2009, 8, 10).¹ Bubbles, conceded Alan Greenspan, the former head of the Federal Reserve, require all those “low long-term interest rates, low inflation and macroeconomic stability,” which we had been told up to that point were a Good Thing (quoted in Guha 2008a; see also Goodhart and Persaud 2008).² According to a leading *Financial Times* economist, Martin Wolf: “A long period of rapid growth, low inflation, low interest rates and macroeconomic stability bred complacency and increased willingness to take risk. Stability led to instability” (2008a).³ Another economist, Robert Samuelson, concluded: “People were conditioned by a quarter-century of good economic times to believe that we had moved into a new era of reliable economic growth” (2011, 16). In short, boom leads to bust; good leads to bad; and the more stable the financial system, the greater the incentive for others who rely on it to take more and greater risks.

The stakes are high in getting this issue right. For example, a great deal of attention was paid to the moral hazard involved in bailing out risk-taking banks and investors. The fear is that bailouts and handouts serve only to whet the appetite for risk. The stability-leads-to-instability argument suggests a more urgent moral hazard, however: Every day that mess managers reliably provide critical services under increasing budget and staff constraints is one more day that executives, politicians, and other leaders feel they can bet the company by taking riskier Big Experiments. Even journalists saw this. Writing about the financial mess, Christopher Caldwell underscored the point: “The longer the [credit and finance] system went on without collapsing, the more incentive there was to strip protective ‘give’ out of the system” (2008a).

In order to make sense of mess and its management, we must have a sharper appreciation of reliability's role in all of this. To do that means we have to have a better definition of "reliability" than a stability that is both the cause of and antidote to instability. In chapter 1, I initially defined "reliability" as predictability or controllability of a service that society considers vital. Let us begin, then, with the professionals who aspire to meet critical service requirements safely and continuously, even during peak demand and turbulent times. The critical services can be in the form of financial services, electricity, telecommunications, and water; in the same way, managers and operators outside society's critical infrastructures insist that they too provide critical services, as for social and health services. Reliability means the lights stay on, even when some generators do not, and the ATM works, even when electricity does not. When the lights go out or ATMs fail, the subsequent effects across interconnected personal and professional systems can be dramatic. Mess metastasizes.

In what sense can we speak of mess that arises because these systems are operated reliably? One conventional answer has it that we are a risk society, where the policy muddles to be sorted out today—air pollution, traffic congestion, financial instability, the junkspace of modernity generally—are those created in the process of trying to produce reliable goods and services (Beck 1999; Bowe 2005; Offer 2006). The resulting messes call for further management and further reliability. What stops this from being a treadmill is that, as we shall see, more and more reliability seems to be directed toward keeping bad messes from happening, while making better use of the good ones that come along. Increasingly, reliability is a form of mess management, not of mess production.

Different Modes of Reliability as Mess Management

To better understand the concept of reliability as mess management, let's see how control operators and managers of major critical infrastructures handle all the surprises and glitches that come by way of having to meet legal and regulatory reliability mandates, all the time and whatever the conditions. Again, reliability here means providing a critical service safely and continuously, even during turbulent circumstances.

A little background is helpful. Reliable infrastructures today differ strikingly from those of earlier periods (LaPorte 1996; Rochlin 1993;

Schulman 1993). In the past, large technical systems were often housed in and controlled by an overarching organization, such as those integrated public utilities that generated, transmitted, and distributed electricity or water. With deregulation, liberalization, and privatization, networks of different organizations are now mandated to provide reliable telecommunication, electricity, and financial services (de Bruijne and van Eeten 2007). Waterworks become comanaged not just by government water departments but now by agencies mandated to protect habitats and species (van Eeten and Roe 2002). Earlier theorizing argued that networks of organizations, some of which have competing or conflicting goals (think of Enron during the 2001 California electricity crisis), should find it more difficult to ensure highly reliable service provision (Roe and Schulman 2008). Parallel developments in social and human services under pressure to outsource have been subject to the same forces. Elements that were once unified under one organization by law for the provision of a vital service have been decoupled by law, only to be recoupled through networks of private and public organizations. That this “management for reliability” now looks and is messy should be no surprise.

Here is what more recent research has to say about such management (first presented in Roe and Schulman 2008).⁴ Imagine a large technical system that faces a wide task environment of varying volatility, while the available responses to that volatility also vary. Volatility is the extent to which system managers and operators confront uncontrollable or unpredictable conditions that threaten their ability to provide the critical service. Some periods are of low volatility: There are no surprising or unscheduled interruptions in the electricity supply, water provision, or financial services. Other periods are ones of high volatility: Temperatures go up, causing increased difficulties to the providers of electricity, water, or health services. In some cases, volatility is high because what no one expected to happen actually does—for example, the Icelandic banking system collapses in a matter of days. Volatility, in other words, refers to the persisting or emerging instabilities in the task environment that confront the network or networks of managers, including system operators. In this chapter, when I speak of “managers,” I primarily mean both large-infrastructure control room managers as well as real-time financial services providers—including face-to-screen traders and brokers—along with their immediate specialist staff. Later chapters extend the analysis to managers of related and other policy messes.

The managers we are talking about here have different resources in

terms of money, personnel, and strategies with which to address the volatility they face. This is called “option variety.” High option variety means that an electric grid or investment firm has more resources available than the regulators require; low option variety means fewer resources are on hand to meet requirements. The systems we are talking about also operate under reliability mandates. They may be *de jure*, as in the case of a bank’s regulated capital reserve requirements, or *de facto*, as when a transmission operator informally keeps a higher reserve of electricity than regulation mandates. Such reliability requirements can derive from system technology and/or organizational features. Supply and demand on the electricity grid (roughly, load and generation) must be balanced to equal each other in real time, or the grid could eventually collapse. Reliability efforts in regard to natural gas transmission focus on avoiding having to shut off the flow of gas completely because it can take days to reactivate the flow, building by building. The hospital emergency room, the highway during rush hours, and the bank’s set of ATMs are reliable only if they ensure safe and continuous critical services when it matters—namely, when the service is needed, often “always right now.” As for the financial services sector, too-safe-to-fail triple-A ratings proved to be highly unreliable when such a rating mattered the most during the panic at the end of 2008.

The two dimensions of task environment volatility (high and low) and options variety (high and low) set conditions for four performance modes that operators and managers work within as reliable service providers. The argument is that reliability in critical service provision (I am now thinking of critical services generally) requires access to all the performance modes, with each mode being its own form of mess management. To be clear, the performance modes are not diamond-sharp categories (that would be too much to expect of the messes of interest here). When reliability requires shifts across performance modes, the distinction between messes demanding to be sorted out and mess management as a demanding way to sort messes blurs into much the same thing (more on this point below). While specific terms for the performance modes vary, for ease of reference I build on the terminology of our electricity research: “just-in-case,” “just-on-time,” “just-for-now,” and “just-this-way” performance. Each is briefly described and then elaborated on as I discuss their features in terms of mess management.

“Just-in-case” performance. When options are high and volatility low, many different options, resources, and strategies exist “just in case”

they are needed.⁵ Reserves are large, excess capacity exists, and ample backups or fallbacks are available, all with little unpredictability or uncontrollability. This seems to be the ideal state of affairs in which to be (for the manager, not the economist), but it is not without its own risk. Operators and managers can grow complacent and end up not paying attention to changes in system volatility and/or options availability. Compared to the other modes, however, managing against complacency is a good mess to be in.

“Just-on-time” performance. When options and volatility are both high, just-on-time performance moves center stage. What worked today or yesterday may not work under very similar conditions tomorrow. A specific resource that was available just before could well not be available right now, and the manager has to be creative on the fly with the other options that remain. This performance condition requires real-time flexibility—that is, the ability to quickly make use of options, resources, and strategies in order to meet the reliability requirements for safe and continuous service provision. Flexibility in real time means operators and managers are so focused in the moment on meeting a reliability requirement that they customize the match between the high volatility they face and the responses available. The match is just enough, just when needed. For example, a supply chain may be flexible (or “resilient”) because multiple vendors in a chain are ready to fill in when one falls short with little notice (Sheffi 2005). (This is why just-on-time performance is not to be confused with just-in-time manufacturing: The latter can be just-plain-late when it actively discourages such flexibility.)

Note that the same system interconnectivity that poses problems also can make new options and resources available. The major risk in just-on-time performance that combines creativity and discretion in how to sort out and assemble different options is misjudgment under the pressures of time and having too many balls in the air. Just-on-time performance means pulling a good mess out of ones that could go bad even in an instant.⁶

“Just-for-now” performance. Using up resources can draw down the options available with which to respond, now and at the next steps ahead. When option variety is low but volatility remains high, just-for-now performance comes into play. “Just keep that valve open for now!” “Just stay late, that’s all I’m asking!” “You’ve got to dial up the pressure from this point on . . .” Just-for-now is the most unstable performance mode, and it is the one that operators and managers want to avoid most or exit from as soon as practicable. Why? Because they could well

back themselves into a corner by trying to be reliable. In this mode, options and volatility are linked, and being reliable now can make reliability all the more difficult to achieve later on. For example, operators and managers might have to go outside official channels or formal procedures to keep things reliable: “Keep that generator online, just for now!” Yet keeping equipment online when maintenance is overdue or insisting that already fatigued workers keep working longer can end up making things worse—which poses a major risk when there are few other options. What would otherwise be marginal, small adjustments can, if prolonged indefinitely, become deviations from the norm that amplify hazards rather than reduce them. Keeping something or someone working for just one hour more under these conditions may crash the system, even when one more hour would be nothing to worry about most other times.

From the standpoint of reliability, this performance mode cannot continue indefinitely. Operators and managers know they are not in complete control here; they know they are resorting to firefighting, band-aids, and quick fixes. They understand how vulnerable the system is, how limited and interdependent options are, and they are busily engaged in trying to develop or secure resources to move out of this state. Just-for-now performance is such a bad mess that, if protracted, it could become the worst imaginable—the system could fail entirely.

“Just-this-way” performance. When the only option left is to reduce volatility directly, just-this-way performance moves front and center. One-way-only command and controls are asserted. A banking holiday is declared, mandatory job furloughs instituted, water conservation measures imposed, and shedding load is enforced through scheduled blackouts. The great risk is that not everyone who needs to comply will comply, when following orders is the only way to ensure reliability. Just-this-way performance is stopping an already bad mess from worsening into a full-fledged crisis.

We are now positioned to summarize the four performance modes as they translate into different forms of mess and mess management. The bad mess is having to manage under just-for-now conditions (high volatility with few options), for if firefighting and temporary fixes don’t work, then major failure needn’t be that far away. Good messes exist with just-in-case or just-on-time performance (high options whatever the volatility), though managing in either of these ways is not without its own hazards. If there is a good mess in just-this-way management (reducing volatility through command and control), it is

stopping the bad from becoming worse. As for the best mess, staying reliable in the face of all the risks means being able to maneuver across performance modes as conditions change with respect to volatility and options. Looked at from the other side, the worst mess is one in which it is not possible to work within any mode, let alone maneuver across them as conditions change. When that occurs you are coping, not managing, in unstudied conditions. The quickest way to go from a bad to worse mess is by extending “until further notice” just-for-now performance, eventually leading to the only “option” left when even emergency declarations and the like simply don’t work: failure and crisis.

The following chapters describe the flesh and bones of these good, bad, worst, and best messes along with their management. What is important to reiterate is that both moving across performance modes and working within any one of them involve risk. Professionals, even at their best, face likely hazards in managing different messes in order to stay reliable in their service provision. These operational risks—complacency, misjudgment, deviance amplification, and noncompliance—are multiple and, as we just saw, vary by conditions and resources. This means that when managers are unable to work within and across the performance modes, risk appraisal on their part ends up becoming very difficult indeed, if not actually impossible. Unable to assess risk and differentiate which risks demand attention, no one can manage the messes for reliability because they are now in unmanageable conditions. This difficulty is nowhere better illustrated than with the 2008 financial meltdown.

Limits of Management in the Financial Mess

The financial meltdown has been attributed to a failure in risk management by banks, investment firms, rating agencies, and regulators, most prominently. One proposal has been to separate risk management from actual banking and investment operations and to elevate the former in importance. “Risk and control functions need to be completely independent from the business units,” recommended Lloyd Blankfein, the head of Goldman Sachs, “and clarity as to whom risk and control managers report to is crucial to maintaining that independence” (2009). But consider the following carefully: How is risk to be separated from operations, as if performance modes could be divorced from their respective risks and messes? True, chief risk officers and their units were marginalized or co-opted by senior banking and investment executives leading

up to the financial mess (FCIC 2011). Granted, one may want to empower risk officers or the enterprise unit to oversee the additional risk imposed by having to manage through different performance modes in order to maintain reliable financial services. But it is quite another matter to assert that it is more useful to have the management of respective risks separated from real-time operations. When not only is the devil in the details but only a devil could know the details, then that can make for the worst mess possible.

It is important to underscore the fact that good as well as bad messes have been witnessed throughout the financial mess—even in events leading up to and after 2008. Just-in-case management is what banks tried to do by increasing their capital reserves through bailout funds without, however, passing those funds on through increased lending; they held onto cash just in case things got worse. That was a good mess to be in from their viewpoint, but the way they managed their mess was part of the bad mess we borrowers found ourselves in at the same time.

Just-on-time management surfaced when liquidity was readily accessible when needed most. Liquidity in finance is the ability of a seller to assemble a deal when times get tough, which in our terms is the ability to assemble options, even if only at the last moment.⁷ Just-on-time liquidity is illustrated in the demise of the \$6 billion hedge fund, Amaranth, in 2006, a collapse foreshadowing worse things to come. As Gillian Tett of the *Financial Times* described it then: “In recent years hedge funds have proliferated, creating a vast pool of investors willing to take risk, and thus act as buyers of the last resort when a crisis strikes. . . . Amaranth illustrates the point. No sooner had it admitted to its losses, than buyers offered to purchase its gas portfolio (averting the prospect of dumping them on the open market)” (2006b). This was a good mess for Amaranth, in contrast to the 2008 bankruptcies that followed.

Just-this-way management in the form of command-and-control measures characterized a significant element of the meltdown. Those special government entities that were central to the U.S. mortgage market, Fannie Mae and Freddie Mac, ended up nationalized. The U.K. government took over management of Northern Rock to stop a bank run. Direct command and control were asserted to ensure that mortgage rates and other lending became less mercurial—all in the name of securing greater authority over reducing volatility directly.⁸ An article in the *Financial Times* noted: “Tensions in money markets are so high we have witnessed the extraordinary spectacle of central banks not

only *providing* liquidity but in effect *becoming* the market” (P. Davies 2008).

All of which leads to that most unstable performance mode, that bad mess of just-for-now. The blowup of those novel, securitized financial instruments meant all manner of just-for-now relaxing of rules, special dispensations, emergency exemptions, and one-time events like the FDIC’s “systemic risk exemption” (on the latter, see Guha et al. 2008). For instance, in March 2008 the Federal Reserve arranged a last-ditch bailout for the nation’s fifth-largest investment bank, Bear Stearns, because the latter risked bankruptcy. How the bailout was managed is illuminating:

In an action almost unprecedented in takeover history, JPMorgan bought 39.5 percent of Bear on the spot to ensure that it would have close to a majority of the votes to approve the deal. That agreement completely disregards New York Stock Exchange’s rules that prevent anyone from buying more than 20 percent of [the] company without a shareholder vote. Other parts of the new agreement either stretch the rules or disregard years of precedent in Delaware, where both banks are incorporated. Of course, all of this rule-bending was done with the tacit, if not outright, approval of the federal government. (Sorkin 2008)

Paul Volcker, the former head of the Federal Reserve, summarized this just-for-now behavior as having taken the Fed to the “very edge of [its] lawful and implied powers” (quoted in Scholtes 2008). Paul Krugman, the Nobel Prize-winning economist, called it “barely legal” (2008a).⁹ Many other just-for-now transactions in banking occurred before the end of 2008, ranging from temporary lines of credit (Chan and McGinty 2010) to just-for-now circuit breakers and kill switches intended to “temporarily” interrupt market prices from falling below set limits.

Being the most unstable performance mode, management under just-for-now conditions bears close scrutiny. In earlier critical infrastructure research (Roe and Schulman 2008), operators and managers told of their great dissatisfaction in having to work under such conditions. In some cases, it meant they had to commit an official violation in order to avoid an even graver error. Worse yet, prolonging such just-for-now performance is a sure way to deprofessionalize operators and managers. You could even define prolonged just-for-now activities as the inability of professionals to come up with better operating practices. When continually resorting to firefighting, quick fixes, and band-aids because they perceive no other alternative, professionals degrade their expertise, and their skills atrophy. This kind of “panic engineering,”

even when necessary, is not something to be prolonged (see Sengupta 2012). What does that mean practically? In one of many examples, Henry Paulson clearly went into his job as Secretary of the Treasury with his professionalism recognized; how that professionalism survived the prolonged 2008 financial meltdown will be a continuing matter of much historical contention, even among Paulson's admirers (FCIC 2011; Sorkin 2009).

Nor is the problem solely one of how endless firefighting can erode the competence of a Treasury secretary or a central bank head. An equally worrisome issue has to be that options and volatility are fully interdependent in just-for-now messes. For example, serious reservations were expressed over loosening restrictions with respect to fair-value accounting during the financial upheaval (Norris 2009). Assets, it was argued, should instead be priced by their owners at what they were forecast or modeled to be, which would be higher than fire-sale prices of distressed sales. Doing so did improve the balance sheets of some who owned these otherwise illiquid assets. In this way, resources and options increased—but, sadly, so did worries over the possible adverse effects on volatility. The gap between these now-imputed prices and what potential buyers really thought the assets were worth could prove to be even greater than imagined before the loosening of restrictions. That would make things even messier (see, for example, Hughes 2009).

These distinctions between modes of mess and mess management matter for two other reasons. First, proposed improvements all too often fall short of producing reliable financial services when effects of those proposals on options and volatility are not made explicit. Adding liquidity in a volatile financial environment means that the system can at best be managed just-on-time rather than just-for-now; in other words, increasing financial liquidity may add options but do little to reduce financial volatility. For instance, a central bank window for emergency lending or a Treasury line of credit may be better at increasing options through added liquidity than at reducing financial volatility. Increasing capital reserve requirements or putting limits on leverage—the ratio of borrowings to equity—may, on the other hand, have everything to do with stabilizing financial volatility without necessarily adding more options for financial managers. A government plan for bank recapitalization to allay public fears over widespread bank insolvency may, in contrast, have just as much to do with reducing system volatility as increasing those banks' options. So clearinghouses for over-the-counter derivatives may also have the virtue of addressing simultaneously the reduction of volatility and the increase in options,

at least to the degree that the clearinghouses are not themselves so interconnected as to increase risks (Dudley 2012; it was even difficult to get detailed counterparty data after 2007 [Tett 2009c]).¹⁰

The differentiated nature of risks is the second reason why the performance modes matter when it comes to managing the financial mess better. We've seen how varying system volatility and options with which to respond to unpredictability or uncontrollability pose different risks of misjudgment, complacency, compliance, and backing oneself into a corner for managers. But these risks together point to two general ones directly related to options and volatility. When there is (1) a permanent reduction in the variety of options for responding to changing task volatility and/or (2) a permanent increase in task volatility that cannot be responded to by a variety of options (whether because of misjudgment, complacency, or whatever), the risk of producing bad messes increases dramatically. That is why the permanent loss of capital in the face of doggedly unstable situations has been one of the most important risks emerging from and evident in the financial mess (see Plender 2011b). Or to put the point the other way round, when implemented proposals actually increase options and/or reduce volatility as just discussed, managing the mess becomes far easier.

Let's stop there for the moment and shift the discussion from good messes that can become bad and bad messes that can get worse to what were the best and the worst messes in the financial meltdown. We've sketched good and bad mess management in terms of specific performance modes, but what about the best financial mess to be in (that is, being able to operate across all performance modes as needed) versus the worst mess to be in (that is, being compelled to operate in unstudied conditions entirely outside known performance modes)?

So far, the worst mess in the financial crisis—and here “crisis” is the correct term—was the panic recorded in the last quarter or so of 2008, when it was in no way evident just who was going to be saved and who would be left to fail. “It feels as if we are 15 minutes away from the end of the world,” the head of equities at a large U.K. bank told the *Financial Times* at that time (quoted in *Financial Times* 2008). “The market has changed more in the past 10 days than it had in the previous 70 years,” reported a senior executive at a European investment bank (quoted in Thal Larsen and Guerrera 2008). “The reality is that we are not going to know what the right price is for years,” said a bond portfolio manager at a major mutual fund (quoted in Bajaj 2008). “It was just mayhem,” said the CEO of a New York-based hedge fund about the markets (quoted in Mollenkamp et al. 2008). “People were paralyzed by

fear of what could erupt.” “We have no idea of the details of our derivative exposures,” conceded a senior official at Lehman Brothers at a meeting of bankers and regulators just before that firm collapsed, “and neither do you” (quoted in Guerrero and Bullock 2008, 16). Just after the Lehman collapse, the chairman of the Federal Reserve was asked, “Well, what if we don’t do anything?” “There’ll be no economy on Monday,” Ben Bernanke replied (quoted in Wolf 2009).

After the plunge in Morgan Stanley shares, a senior manager at the Swiss bank UBS said: “It felt like there was no ground underneath your feet. I didn’t know where it was going to end” (quoted in Sorkin et al. 2008). Nor was he alone. To the global investor George Soros, it felt as if “the financial crisis [was] spinning out of control” (2008, 11). The chair of Morgan Stanley Asia concluded: “We have gone to the edge of an abyss that few thought was ever possible” (Roach 2008, 26). Other citations could be added, but the point remains: The people in the midst of the financial turmoil at that moment—the traders, bankers, and investors—were operating outside of known performance modes and in a region of pervasive unknown unknowns. It turns out that these financial managers hadn’t been managing reliably after all, or else they wouldn’t have ended up where they did, in free fall. If things were this awful, how then can we speak of the best mess to have at the same time?

That Other Mess . . .

The best mess was a very big dog that didn’t bark in the financial upheaval. In circumstances uniformly described as bad to awful, the financial meltdown was accompanied by a silence that went largely unreported. Simply put, while banking and finance are a global infrastructure, the financial mess—even when it morphed into a crisis—did not spread to other critical infrastructures as rapidly and pervasively as it did through the real economy.

The effect on the real economy has been much noted. In the words of the Financial Crisis Inquiry Commission: “Distress in one area of the financial markets led to failures in other areas by way of interconnections and vulnerabilities that bankers, government officials, and others had missed or dismissed” (2011, 27). True, but then why didn’t it spread further into other critical infrastructures? After all, critical infrastructures are said to be highly connected. “Interconnected systems too complex and dangerous to fail are not unique to financial

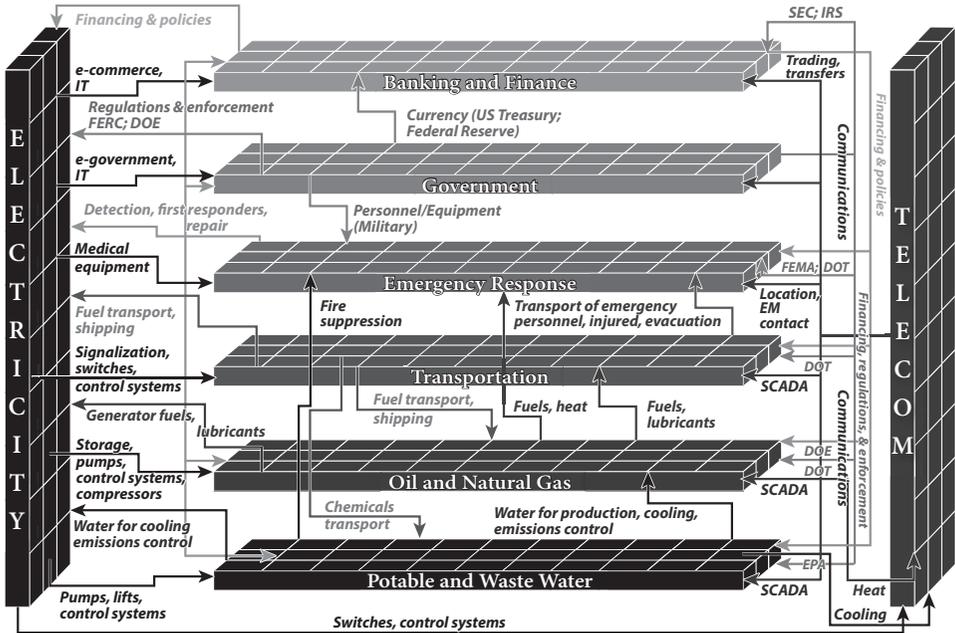


Figure 1. Interdependencies among eight critical infrastructures

Source: Heller 2002

services,” writes the economist John Kay (2009a). “Failure could also have catastrophic consequences in electricity networks, oil refineries and petrochemical plants.” Which is to say we should expect the failures themselves to be potentially interconnected and propagated. Consider the cat’s cradle of interconnected critical infrastructure in figure 1. Other immeasurably more complicated diagrams have been developed since this one (Europeans focus on even more critical infrastructures, as we see below), but figure 1 is sufficient to make the present point.

Consistent with figure 1’s feedback loops across infrastructures, we witnessed some impact of the financial crisis on the sectors of transportation and of oil and natural gas, if only through the freezing up of credit, trade finance, and investment in shipping and public transportation (see Wright 2008, 2009). The financial contagion certainly hampered infrastructural projects in transportation and ports (Little 2009). Associated volatility in markets has as well affected state government revenues (see, for example, Bullock 2011), which in turn affected maintenance and construction budgets and planning for infrastructures. As

the financial mess developed between 2007 and 2008, the Financial Crisis Inquiry Commission found “countless governments, infrastructure projects, and nonprofits on tight budgets were slammed with interest rates of 10% or higher” (2011, 278). Still, figure 1—and again, not only this figure—suggests that a considerable impact of the financial mess should have been felt through the electricity sector, for example, because electricity, like telecommunications, is a critical infrastructure bookending other infrastructures and their sectors depicted in the figure.

Was electricity affected by the financial mess in the similar ways that transportation was? Not if we rely on those same reports about the financial meltdown. While the upheaval clearly affected plans for future infrastructure in electricity (see, for example, Crooks 2008; Wigglesworth, Sakoui, and Kerr 2009), it did not affect real-time operations in any newsworthy way, at least not up to the time of this writing—save for one major possible exception: the massive 2012 electrical blackout in India. That outage was connected to interrelated problems in India’s electricity and banking sectors, though how much those problems were due to the global financial mess as distinct from political issues in India remains an open question (Sender and Crabtree 2012). Reports, however, predict that the “world will witness [a] big demand for investment in energy infrastructure over the coming decades” (Davis 2008). There is also confirmation that other large technical systems, such as railroads, have taken advantage of the post-2008 economic downturn to construct new facilities, as construction companies eager for work come in under budget (Schwartz 2012).

No one doubts that the real economy was hit hard by the financial upheaval, so what is going on here?¹¹ The short answer appears to be that other infrastructures continued to manage, however messily, in the face of the financial turmoil and in ways demonstrably different from what was happening in parts of the banking and finance infrastructure. The only study I know that examines cross-infrastructure cascades has been undertaken by the Dutch research body, TNO Defence, Security and Safety, and the Delft University of Technology (Luijff et al. 2008). As of September 2008, the TNO database covered 2,650 critical infrastructure (CI) disruptions in 164 nations with 1,090 cascading outages. Table 1 records the subset of 1,749 CI failure incidents in 29 European nations, where an incident—when not independent and isolated—could initiate a cascade in the critical infrastructure or result in a cascade in another infrastructure. The majority of incidents are isolated within the infrastructure concerned (1,017 versus 769). The TNO study concludes: “Our analysis of the collected data

Table 1. Categorization of number of CI disruption events

CI sector	Cascade initiating	Cascade resulting	Independent	Total	Sample size
Education	0	3	1	4	4
Energy	146	75	388	609	590
Financial services	1	26	33	60	60
Food	0	4	4	8	8
Government	2	40	26	68	67
Health	1	16	22	39	39
Industry	5	15	7	27	27
Internet	15	51	95	161	160
Postal services	1	0	0	1	1
Telecom	69	125	114	308	295
Transport	19	128	276	423	422
Water	9	18	51	78	76
Total	268	501	1017	1786	1749

Source: Adapted from Luijff et al. 2008

shows that most cascades originate from only a limited number of critical sectors (energy, telecom) and that interdependencies occur far less often than most theoretical studies assume” (Luijff et al. 2008).¹² Note how few cascades are initiated by the financial services sector, compared to the energy and telecom sectors.

In contrast to figure 1 with all its interconnections, but in light of the patterns emerging from TNO’s database, what is striking is how resilient other infrastructures have been in the face of the financial mess, when we would have expected them to have been more vulnerable. Again, circumstances could have changed by the time you read this—the collapse of Lehman Brothers, for example, took a weekend. Even so, nearly all these tightly coupled, complexly interactive connections between and among infrastructures seem to have been managed reliably, at least during the first thirty-six months of the financial mess. Yet bankers and their critics still focus on contagion and the high interconnectivity of banking and finance to the rest of the world (FCIC 2011; Tett, Freeland, and Braithwaite 2010).

Why was there any capacity to be resilient and anticipatory in such a

world? Why exactly was there the ability of operators and technology to absorb a shock or bounce back while working out the next steps ahead? Here we must speculate, as so few have reported on this dog that didn't bark. Research on water and electricity suggests the resilience is due to the ability of their operators and managers to change their management as conditions change. That is, interconnections that appear to be tightly coupled are more loosely coupled than many think—and they are loosely coupled because they were engineered and are managed to be so. “Dependencies” among many infrastructures, write Eric Luijff and his colleagues (2010, 16) in a later and longer review of the TNO data, “are anything but unmanaged.” When true, that is the very best mess to be in for other critical services if parts of the banking and finance infrastructure are rife with contagion. Mess has been always possible given the sheer interconnectivity between and among infrastructures, while the best mess was best because many infrastructures have managed those interconnections in ways to keep many of them latent—so far.

The best and worst messes occurred at the same time during the financial upheaval. If the worst mess when it comes to reliable performance means having to work outside what you know, while the best mess is managing reliably with no more than what you do know, then both were visible in the period up to and after 2008. That leads to a question: If one major reason why this happened was due to the fact that the interconnectivity that brought down much of the securitized finance system was managed differently than the interconnectivity within and between other systems, then just what were those more successful “management skills”?

We turn to these skills next. The typology I've detailed in this chapter is part of a wider framework, which enables us to see what it takes to manage a bad mess so it does not get worse or to pull out a good or even better mess. We have been introduced to types of messes and mess management, but what skills do managers actually have that can help them manage well rather than poorly? What is their domain of competence, and how does it relate to managing messes reliably? We turn now to that wider framework and what it means in practice for different policy messes—including, but not limited to, the financial mess.