From Here to There:
How will it Fail?

Ben Adida

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VotingWorks

Disclaimer:
These are early reactions,
I’m sharing them raw.

1. Complexity
2. Operationalizing
3. Do Audits Ever Fail?

Complexity

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“Everything should be made as simple as possible, but not simpler.”
-- Albert Einstein (attributed)

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“It can scarcely be denied that the supreme goal of all theory is to make the irreducible basic elements as simple and as few as possible without having to surrender the adequate representation of a single datum of experience.”
-- Albert Einstein (original)

https://web.mit.edu/2.75/resources/random/How%20Complex%20Systems%20Fail.pdf

Complexity: How Complex Systems Fail

Cognitive Technologies Laboratory

How Complex Systems Fail

(Being a Short Treatise on the Nature of Failure; How Failure is Evaluated; How Failure is Attributed to Proximate Cause; and the Resulting New Understanding of Patient Safety)

Richard I. Cook, MD
Cognitive technologies Laboratory
University of Chicago

1) **Complex systems are intrinsically hazardous systems.**
All of the interesting systems (e.g. transportation, healthcare, power generation) are inherently and unavoidably hazardous by the own nature. The frequency of hazard exposure can sometimes be changed but the processes involved in the system are themselves intrinsically and irreducibly hazardous. It is the presence of these hazards that drives the creation of defenses against hazard that characterize these systems.

2) **Complex systems are heavily and successfully defended against failure.**
The high consequences of failure lead over time to the construction of multiple layers of defense against failure. These defenses include obvious technical components (e.g. backup systems, 'safety' features of equipment) and human components (e.g. training

Complexity

Complex systems fail in complex ways

(it’s nonlinear)

Can we relentlessly simplify?

- Simpler in explanation
- Simpler in operation
- **Harder to screw up**
- Every bit of complexity on its own makes sense.
  If we don't fight relentlessly for simplicity,
  overall system complexity increases
  and the failure modes get worse non-linearly.

Operationalizing

Operationalizing

- Aviation, medicine, modern software incident response,
  all perform complex tasks under time pressure and other constraints
  by **operationalizing via checklists**.

- Some election operations already do this -- let's apply that to audits.

- We've heard this: guidebooks, documentation, sharing experiences.

- Let's take it one step further: standardize ruthlessly, checklists for everything.

- Additional complication: regular staff changes.
  What can we learn from the military?

Do Audits Ever Fail?

Do Audits Ever Fail?

- The talks covered a lot of audit success
- Some of the hallway conversations alluded to failures and rough edges
- We should talk about these failures. We cannot learn without them.
- The criticality of the audit process makes this hard.

Do Audits Ever Fail?

- Think about how hard
  the first inconclusive audit will be.

- Think about how hard
  the first audit that overturns a result will be.

- In software, tests that never fail are suspicious.
  Maybe we should feel the same way about audits?

1. Complexity
2. Operationalizing
3. Do Audits Ever Fail?

1. Can we simplify?
2. Can we checklist-ify?
3. Can we discuss Failures?