RHCN Summer Meeting
26-28 August 2013

The Individual – Collective Tradeoff: Implications for Resilience

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prologue – competing views

view 1 – tradeoffs characterise resilience

sacrifice decisions

trading lower for higher level goals

REA Symposium 25th – 27th June 2013

Theme: Managing trade-offs

risk management approaches are based on hindsight and emphasize error tabulation and calculation of failure probabilities, Resilience Engineering looks for ways to enhance the ability of organizations to create processes that are robust yet flexible and adaptive, to monitor and revise risk models, and to use resources proactively in the face of disruptions or ongoing production and economic pressures.

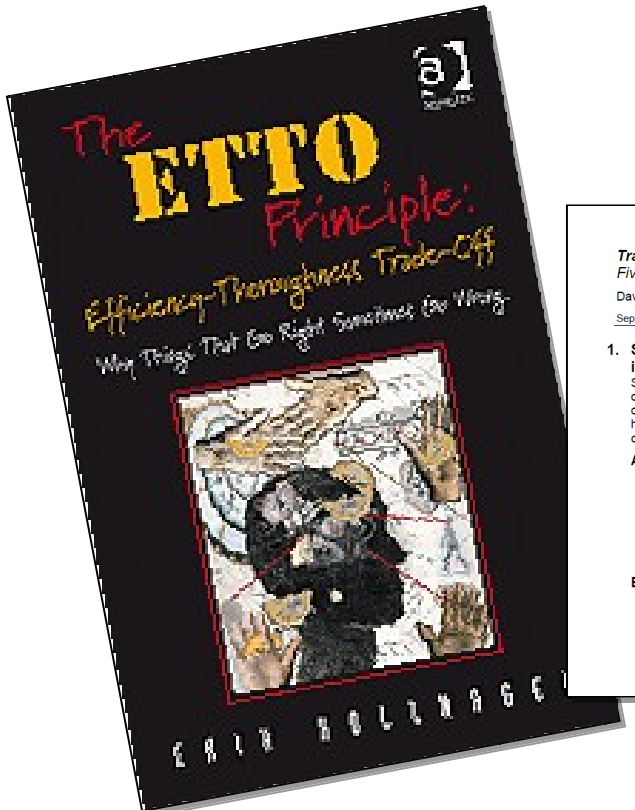
The Resilience Engineering Association is proud to announce the 5th symposium 'Resilience Engineering: Managing trade-offs'. The REA organizes this symposium in 2013 in the Netherlands in cooperation with TNO hosting the symposium at Soesterberg.

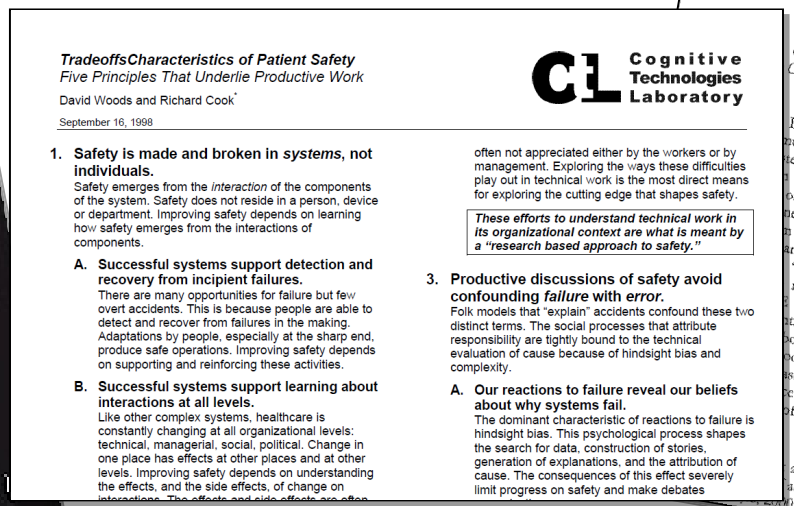
prologue – competing views

view 2 – tradeoffs are ubiquitous
so they can't characterise resilience

an agnostic view

understanding tradeoffs
is important
in understanding work, safety, performance





TradeoffsCharacteristics of Patient Safety
Five Principles That Underlie Productive Work

David Woods and Richard Cook

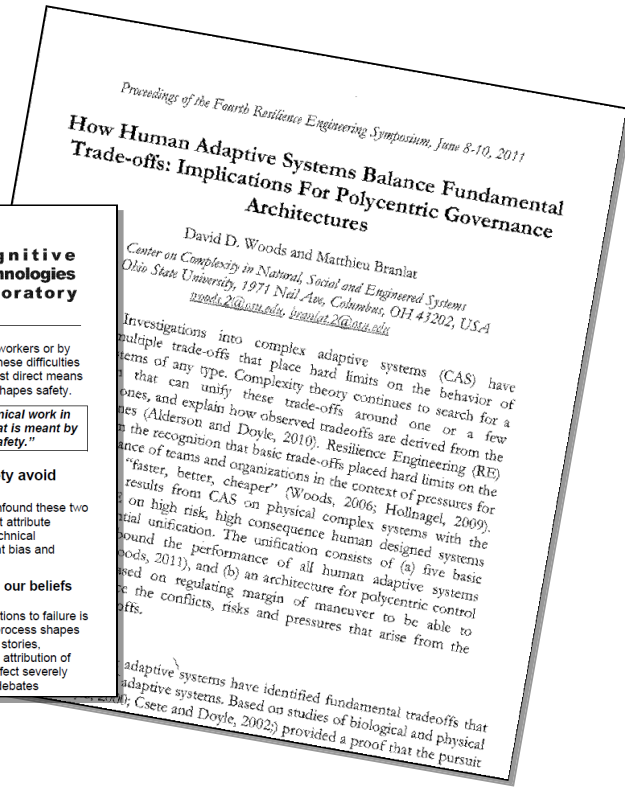
September 16, 1998

Cognitive Technologies Laboratory

1. **Safety is made and broken in *systems*, not individuals.**
   Safety emerges from the *interaction* of the components of the system. Safety does not reside in a person, device or department. Improving safety depends on learning how safety emerges from the interactions of components.
   - A. **Successful systems support detection and recovery from incipient failures.**
     There are many opportunities for failure but few overt accidents. This is because people are able to detect and recover from failures in the making. Adaptations by people, especially at the sharp end, produce safe operations. Improving safety depends on supporting and reinforcing these activities.
   - B. **Successful systems support learning about interactions at all levels.**
     Like other complex systems, healthcare is constantly changing at all organizational levels: technical, managerial, social, political. Change in one place has effects at other places and at other levels. Improving safety depends on understanding the effects, and the side effects, of change on interactions. The effects and side effects are often not appreciated either by the workers or by management. Exploring the ways these difficulties play out in technical work is the most direct means for exploring the cutting edge that shapes safety.

These efforts to understand technical work in its organizational context are what is meant by a "research based approach to safety."

3. **Productive discussions of safety avoid confounding *failure* with *error*.**
   Folk models that "explain" accidents confound these two distinct terms. The social processes that attribute responsibility are tightly bound to the technical evaluation of cause because of hindsight bias and complexity.
   - A. **Our reactions to failure reveal our beliefs about why systems fail.**
     The dominant characteristic of reactions to failure is hindsight bias. This psychological process shapes the search for data, construction of stories, generation of explanations, and the attribution of cause. The consequences of this effect severely limit progress on safety and make debates



Proceedings of the Fourth Resilience Engineering Symposium, June 8-10, 2011

How Human Adaptive Systems Balance Fundamental Trade-offs: Implications For Polycentric Governance Architectures

David D. Woods and Matthieu Branlat

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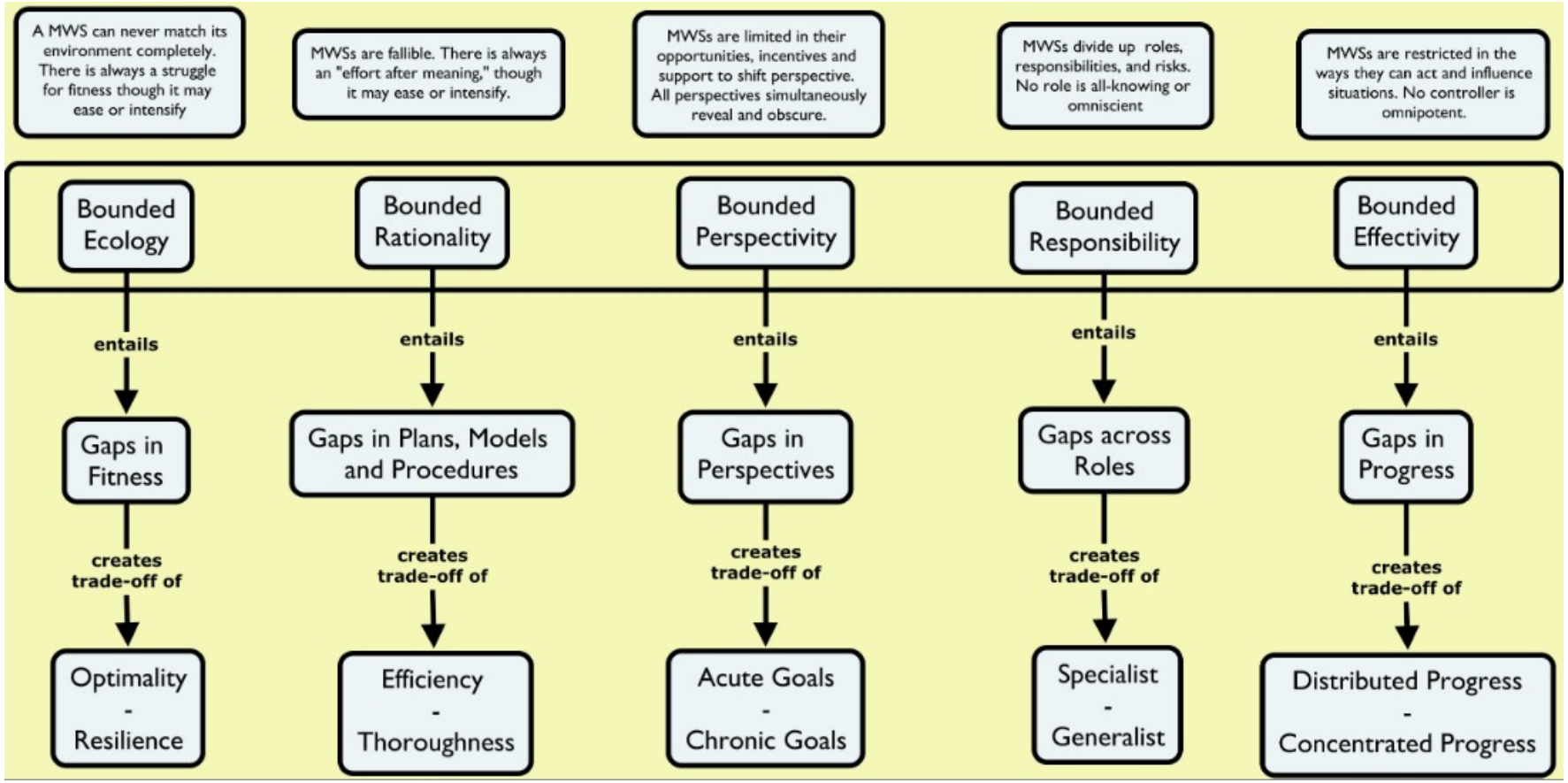
Investigations into complex adaptive systems (CAS) have
multiple trade-offs that place hard limits on the behavior of
tems of any type. Complexity theory continues to search for a
that can unify these trade-offs around one or a few
ones, and explain how observed tradeoffs are derived from the
nes (Alderson and Doyle, 2010). Resilience Engineering (RE)
the recognition that basic trade-offs placed hard limits on the
ance of teams and organizations in the context of pressures for
"faster, better, cheaper" (Woods, 2006; Hollnagel, 2009).
results from CAS on physical complex systems with the
on high risk, high consequence human designed systems
tial unification. The unification consists of (a) five basic
ound the performance of all human adaptive systems
ods, 2011), and (b) an architecture for polycentric control
sed on regulating margin of maneuver to be able to
e the conflicts, risks and pressures that arise from the
offs.

adaptive systems have identified fundamental tradeoffs that
adaptive systems. Based on studies of biological and physical
; Csete and Doyle, 2002) provided a proof that the pursuit

grand unified theory*



*Hoffman & Woods 2010,
Woods & Branlat 2011

5 fundamental tradeoffs

bounded ecology	gaps in fitness	optimality – resilience
bounded cognizance*	gaps in plans, models	efficiency – thoroughness
bounded perspectivity	gaps in perspectives	acute – chronic
bounded responsibility	gaps across roles	specialist - generalist
bounded effectivity	gaps in progress	centralized – decentralized

*Simon's 'bounded rationality'

is there a sixth tradeoff?
or does it fit one of the five?

individual – collective tradeoff

2 manifestations

staff level – locus of accidents, incidents, performance

patient level – clinical goals, risks, benefits

individuals *vs* systems

- common presumption in healthcare to locate performance (good or bad) in individuals
  - deeply embedded in Western culture
  - heroic narratives, villainous narratives
  - in either case, one doctor, one patient, locked in isolation booth
  - ‘when everyone is responsible, no one is responsible’
- but complex organisations can achieve outcomes (good or bad) unreachable by individuals in isolation
- while they introduce new sources of failure
  - dis-coordination, working at cross purposes, conflict
- fundamentally, a tradeoff in analysis, but not in performance

patients *vs* populations

dominant safety & performance orthodoxy

practice guidelines, standardisation, ‘evidence-based medicine’

tend to privilege collectives over individuals

average results in groups trump individual results

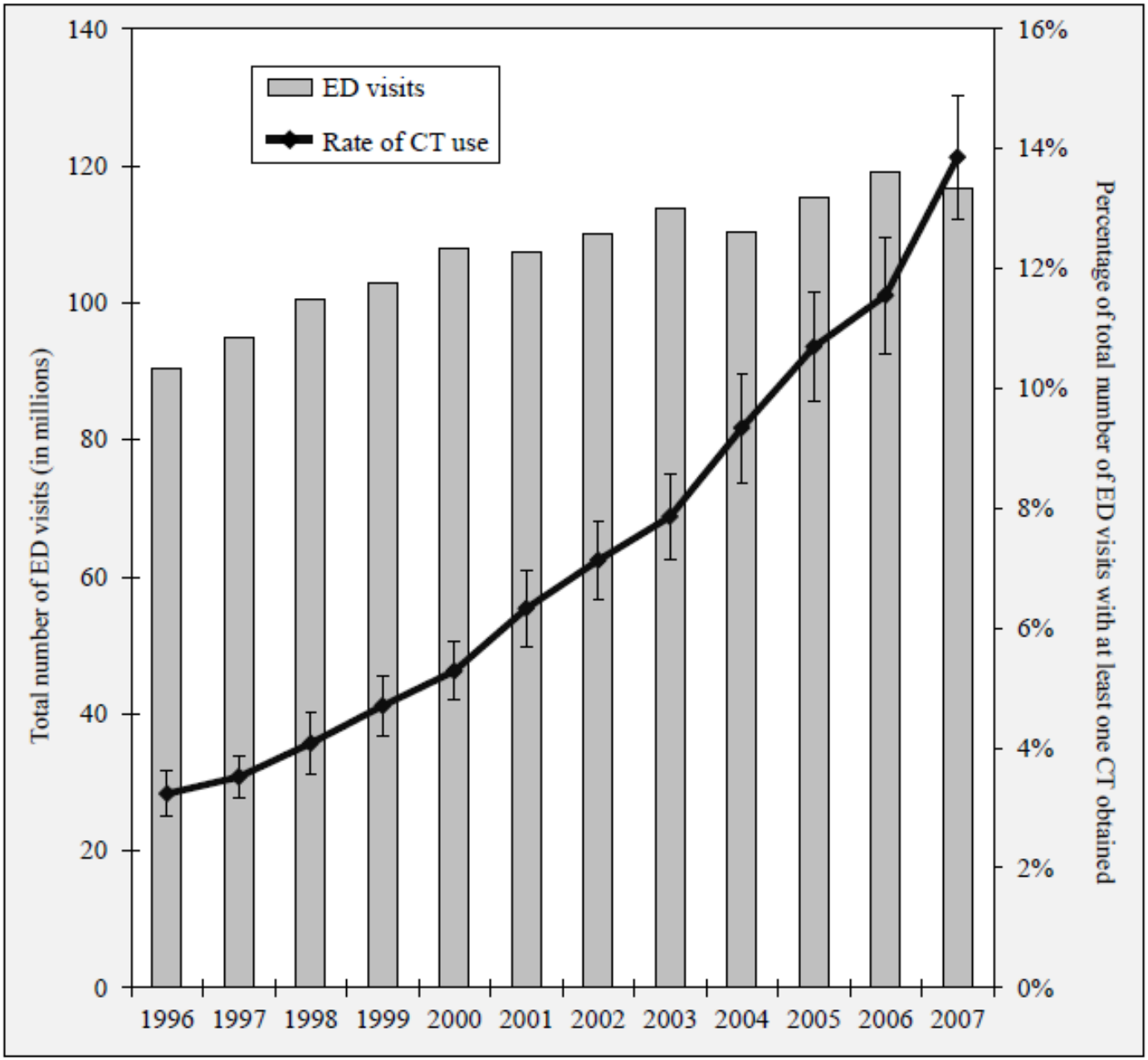
ecological fallacy: attributing aspects of a collective to its component individuals

optimality fallacy: optimizing component performance tends to sub-optimize the whole

examples

need to limit imaging, work-ups, treatment in common presentation, rare hazard situations

- chest pain (ACS, PE, dissection)
- head injury (intracranial hematoma)
- antibiotic stewardship (conflating small benefit w/ no benefit)


ED visits
Rate of CT use
Total number of ED visits (in millions)
Percentage of total number of ED visits with at least one CT obtained
0
20
40
60
80
100
120
140
0%
2%
4%
6%
8%
10%
12%
14%
16%
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007

example

managing hypertension

- small number of patients avoid heart attacks, strokes
- most will not have heart attack or stroke, whether treated or not
- all are subjected to lifelong medication, expense, potential for adverse effect, possible stigmatization

in theory, this privileges individual above the collective

but the argument in favour generally based on the (false) claim of cost-savings

so a ‘collective benefit’ argument is used even here where the reverse holds

implications

for resilience:

- tradeoff in evaluating performance
- yet another task for monitoring, responding, anticipating, learning

for everyday clinical work:

- these tradeoffs are inescapable
- a classic double bind
  - workers have to resolve ambiguities through their specific actions
  - without explicit support

ethical implications

another classic dilemma / tradeoff

deontological ethic

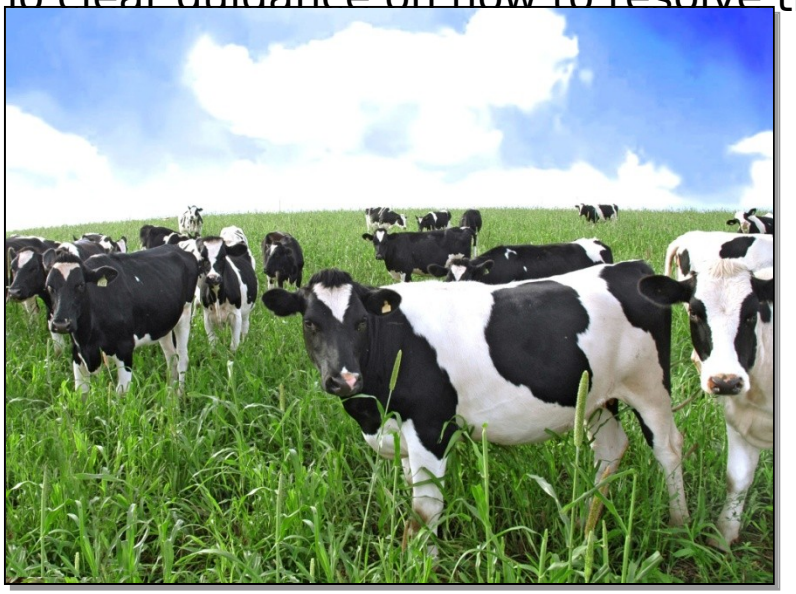
- people have a non-negotiable right to treatment
- physicians have an affirmative duty to offer it
- irrespective of the difficulties (or costs) involved
  - note no support for resolving competing claims

ethical implications

another classic dilemma / tradeoff

consequentialist ethic

- the net effects across the population of interest are dispositive
- ‘greatest good for greatest number’
  - note again, no clear guidance on how to resolve this conflict



does this tradeoff fit in GrUnTh?

if at all …

- bounded perspectivity
- agents at any level occupy a point of view that simultaneously reveals and obscures
- originally expressed as acute – chronic tradeoff
- between short-term and long-term goals

- could be expanded to include other sorts of ‘stances’

does this tradeoff fit in GrUnTh?

but also has elements of ...

- bounded responsibility
  - different actors differentially responsible for different subsets of goals
  - specialist – generalist tradeoff
- bounded effectivity
  - centralized (collective) *vs* polycentric (local, individual) control
  - distributed – concentrated tradeoff

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