

*David Chapman
September 2019*

**Leveling up systems
in a whitewater world**

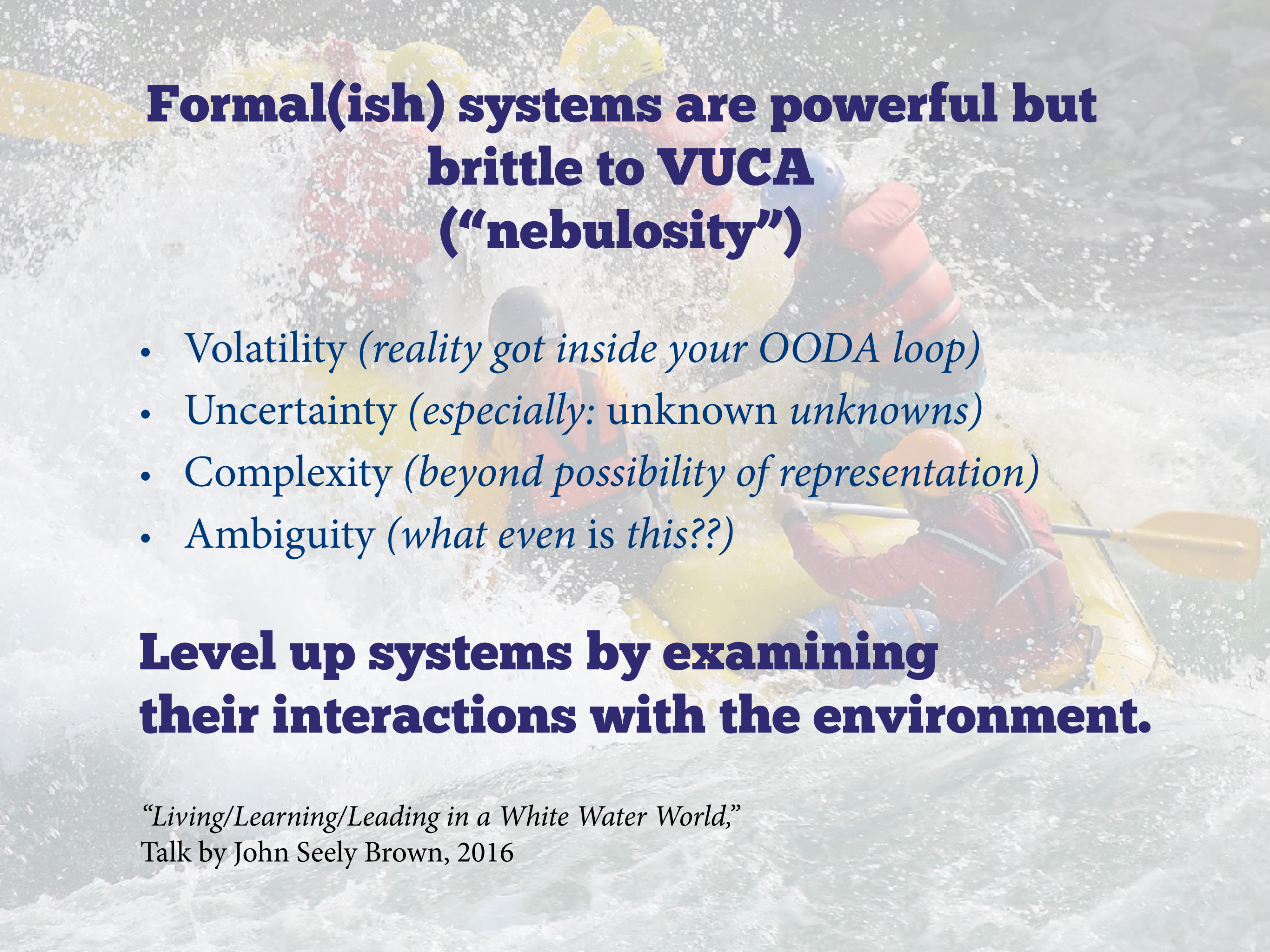
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ALPHA TEST

**Leveling up systems
in a whitewater world**

meaningness.com/eggplant

A group of people in a yellow raft navigating white water rapids. The raft is filled with people wearing helmets and life jackets, paddling through turbulent water. The scene is dynamic and captures the intensity of the activity.

Formal(ish) systems are powerful but brittle to VUCA (“nebulosity”)

- Volatility (*reality got inside your OODA loop*)
- Uncertainty (*especially: unknown unknowns*)
- Complexity (*beyond possibility of representation*)
- Ambiguity (*what even is this??*)

Level up systems by examining their interactions with the environment.

“Living/Learning/Leading in a White Water World,”
Talk by John Seely Brown, 2016

Systemic breakdowns

- Personal development
Loss of meaning / Loss of identity
- Relationships (work and personal)
Emotional flooding / Alienation
- Technical work (science, engineering, technology)
Replication crisis / Eroom's Law / Software sucks
- Business management and economics
Theranos / Rent-seeking / Great Stagnation
- Society
Political system broken / Loss of community
- Culture
Triviality / Culture war / Fake news / Moral panics

Meta-systematicity

- A sometimes-highly-valuable template for thinking in many domains (*not a Theory Of Everything*)
- We all do this, but we could do it much better. Un-named, under-appreciated, under-theorized, **not taught** in universities
- Not my own thing (developmental psychology, management theory, sociology of science, design practice, ...)
- Examine how systems **interact** with their environments, and with each other
- Evaluate, select, combine, modify, discover, create, and monitor systems—in context, standing **outside** them
- **Rework** both sides of system/environment interactions
- Lots of specifics—way too much for this session!

Leveling up: meta-systematicity

- Personal development
Confident, fluid identity addressing fluid meaningfulness
- Relationships (work and personal)
Effective intimacy through skillful boundary negotiation
- Technical work (science, engineering, technology)
Power & resilience by contextual reflection & reworking
- Business management and economics
On-going reflective structural transformation
- Society
Deliberately developmental society
- Culture
Enjoyment, meaning, and wonder—without rigidity

Informal work makes formal systems work

“Blueprints don’t tell you how to build anything unless you have implicit knowledge not contained in the blueprint.” —John D. Cook

- A **support structure** of informal perception, reasoning, activity, tools, and social organization is needed to make any formal system work
- “How do we make sense of this **messy concrete situation** in terms of the abstract categories of the system?”

Seeing-as, counting-as

- “What can we reasonably treat this formalism as **trying to say**, and tell us to do, here?”

Interpretation, improvisation

Improving informal support structures

- This is one type of meta-systematic work
- **Shielding** the system from stuff it can't cope with
- Re-designing the **surrounds** (material infrastructure, skills, and social organization) **to better fit** the formal system's (necessarily and obviously somewhat simplistic & inaccurate) model
- On-going **mutual accommodation** of informal and formal aspects as their **patterns of interactions** emerge into understanding

Reworking system/context interactions

Checklist policy is not working; surgeons are ticking every box before they start.

- 1. The trouble is due to a fault in the system.** The policy and/or its technical implementation (software) need systematic, rational revision. *Technical people think of this possibility first.*
- 2. The trouble is in reality.** For instance, people are choosing not to conform to the system because they are not aligned with its goals. Change their incentives with added/strengthened mechanisms. *Administrative/managerial people think of this possibility first.*
- 3. The trouble is in the informal use of the system in concrete situations.** It is sometimes ambiguous or irrelevant in actual cases. The entities it takes for granted are not identifiable, relevant features can't be fit to the categories, or the work it demands is meaningless. Improvement requires ontological reformulation on both sides. *Few people are trained to think of this first.*

Informal laboratory contingencies

- Making it work by any means necessary (improvisation; duct tape)
- Losing the phenomenon (it just stops happening for no reason)
- An issue can get settled even without definite proof criteria
- Faking yourself out (sometimes repeatedly)
- Dread of, and provisions for, demonically wild contingencies
(*mosquito somehow got into the STM's vacuum chamber*)
- Fixing it up even while using it in production
- Adapting imported methods and equipment to your lab and problem:
"The tools teach you"
- "Golden hands" vs. klutz, ignoramus, flake, careless, etc.

Adapted from "Respecifying the natural sciences as discovering sciences of practical action: (I & II) Doing so ethnographically by administering a schedule of contingencies in discussions with laboratory scientists and by hanging around their laboratories."

Harold Garfinkel, Eric Livingston, Michael Lynch, Albert B. Robillard, and Perry Taka, unpublished, 1988

Meta-systematic contingencies (I)

- It was a vast chaotic mess, not a coherent problem. We started by... (*dissecting mosquitos*)
- That system was formally applicable but it didn't work well in practice (*Kalman filter ALL THE THINGS*)
- With experience, we realized we needed different, cross-cutting categories (*what is a planet? Dalton: substances*)
- “What is actually going on here?” Not taking the standard ontology as given (*molecular shape representation*)
- Could we adapt a foreign framework to work here? (*Ethnomethodology at Xerox PARC*)
- The system was sliding into chaos as circumstances changed, but it had worked so well before that no one was responsible for sounding an alarm (*banking in 2008*)

Meta-systematic contingencies (II)

- Feeling for when to push for precision *vs.* avoiding premature formalization (*the Semantic Web; Biometricians vs Mendelians*)
- Acting with *reference to* and *respect for* the system's rules, but not *governed by* them (*rethinking $p < 0.05$*)
- Making the system work, without formal changes, through reinterpretation, improvisation, and negotiation in context (*every medical provider in America*)
- What do we have to work out in advance, and what can we just deal with when we get there? (*experiment pre-registration*)
- The system keeps breaking down; we repair failures ad hoc; we turn common fixes into new rules; but how do we know when to rework the core? (*every long-lived software project*)
- “All models are false, but some are useful.” Specifically how is this one useful? What are its failure modes? Especially w.r.t. unknown unknowns. Workarounds?
- Effectively combining incompatible systems without reconciling them (*trading zones*)
- Choice between updating reality *vs.* updating the system's model (or both!)

Summary (not systematic/exhaustive)

- Getting from a mess to a problem
- Formally applicable system doesn't work well in practice
- Adapting a system from a seemingly unrelated domain
- Need to monitor system's real-world performance, not accepting internal metrics
- “What is actually going on?” Not taking standard model for granted
- Reworking the categories
- Push for precision? Or will that result in premature formalization?
- Acting beyond the rules without violating their spirit
- Making the system work with reinterpretation, improvisation, and negotiation
- Figuring out what to plan vs. what to improvise
- Is it time to rework the core of the system?
- What might be the system's failure modes in the face of unknown unknowns?
- Combining incompatible systems without reconciling them
- Changing reality to fit the system vs. changing the system to fit reality

```
193
194 if (nrec == 0)
195     return (__EIT_entry *) 0;
196
197 left = 0;
198 right = nrec - 1;
199
200
201
202
203
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214
```

Senior technical positions require meta-systematic thinking and acting

<i>Procedure-level programming</i>	<i>System-level development</i>
Full specification	Requirements are nebulous
Perfectly deterministic	Effectively unpredictable
Complete understanding possible and desirable	Complete understanding impossible
Problem solving	Mess management
Reasoning about what the runtime does	Reasoning about what people do
Rational methods necessary and sufficient	Meta-rationality required
Technical mastery	Meta-systematic competence
Junior programmer	System architect / CTO

Aspect	Reasonable	Rational	Meta-rational
Relationship with reality	Interactive	Detached	Reflectively relating formalism and reality
Breadth of considerations	Context-dependent	Universal	Context-crossing
Effective action	Improvised	Planned	Flexible contextual use and revision of plans
...	<i>Ad hoc</i>	Systematic	Meta-systematic
Purposiveness	Purpose-laden	Purpose-independent	Evaluating and coordinating purposes
Contingencies	Routine	Exceptional or problematic	Reflective
... Problems	Everyday hassles	Solution specifications	Messes to manage
Inference	Accountable, negotiable	Truth-preserving	Meta-epistemic
Epistemology	Informal	Formal	Relating formal and informal
...	Concrete	Abstract	Crossing abstraction levels
...	Specific	General	Relating details with big picture
...	Implicit or tacit	Explicit	Relating implicit and explicit
...	Knowing how	Knowing that	Understanding in context
...	Reasonable account	Rigorous theory	Context-crossing understanding
Ontology	Nebulous	Clear-cut	Relates formal patterns and nebulosity
... Categories	Family resemblance	Rigorous definition	Reflection on boundaries
... Truth	More-or-less	Absolute	“In what sense?”



Trading zones

“Proton”

$$|p_{\uparrow}\rangle = \frac{1}{\sqrt{18}}[2|u_{\uparrow}d_{\downarrow}u_{\uparrow}\rangle + 2|u_{\uparrow}u_{\uparrow}d_{\downarrow}\rangle + 2|d_{\downarrow}u_{\uparrow}u_{\uparrow}\rangle - |u_{\uparrow}u_{\downarrow}d_{\uparrow}\rangle - |u_{\uparrow}d_{\uparrow}u_{\downarrow}\rangle - |u_{\downarrow}d_{\uparrow}u_{\uparrow}\rangle - |d_{\uparrow}u_{\downarrow}u_{\uparrow}\rangle - |d_{\uparrow}u_{\uparrow}u_{\downarrow}\rangle - |u_{\downarrow}u_{\uparrow}d_{\uparrow}\rangle]$$

Coordinating incompatible systems

Peter Galison, “Trading Zone: Coordinating Action and Belief.” In Mario Biagioli, *The Science Studies Reader*, 1999.

Trading zones



- Incommensurable systems of understanding
- Productive collaboration without harmonization
- What makes this work well, or not so well?
- How can one do this better?
- Pidgin → Creole
- Interactional expertise: translation function