Complex Systems
The Trouble With Learning In Complex Systems
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Two Types Of Systems

There are systems in which we can determine cause and effect...

there are those in which we cannot.
Ordered  Un-ordered
Ordered Systems
“Something unknown is doing we don’t know what.”

- Arthur Eddington
Ordered  Un-ordered
Un-ordered Systems
Sociotechnical Systems
In complex systems, causality can only be examined, understood, and determined in... hindsight
Application Specialists
Infrastructure Specialists
Database Specialists
Network Specialists
Imperfect Information
Requirements to Learning
Improvement Requires Set Back
Challenges to Learning

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Learning Opportunities Are NOT Distributed Evenly
Consequence of Failure

- Code Commits
- Config Changes
- Feature Release
- Incident Response

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Low stakes + high frequency = high opportunity

High stakes + low frequency = low opportunity
Frequency = opportunity
What even is an incident?
Incidents are:
Subjective
Feared & Avoided
Prevention Is a Fool’s Game
“It cost you an outage to get to that data.”

- Nida Farrukah (Monitorama PDX 2019)
To label incidents and disruptions as *bad* is not just a misunderstanding of how complex systems work...it is *counterproductive*. 

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Incidents are the continuous feedback of your complex system
Techniques To Learn

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Root Cause Analysis is insufficient!

We need more data

jhand.co/PIR_book
Timeline of Events

13:45:06: ALERT: SLO BREACH - Latency on: Db_User_Login_Prod - (Customers Impacted) - Sev03

13:46:34: ACK: Primary On-call Engineer

13:49:27: E1: Log Analytics shows we’ve been escalating rapidly since around 1:30 p.m.

13:50:53: E1: @E2 … are you available to take a look? I’m not sure where to look next.

Incidents are NOT: Linear
Isn’t
Linear

Reality
“If each (component) of a system has a total of six distinct inputs and outputs, and we have only ten modules, there are more ways of connecting all these modules together than there are stars in the universe.”

- Samuel Arbesman (Overcomplicated)
“A critical component of high resilience in organizations is continuous learning from events, ‘near miss’ incidents, and accidents.”

(Weick et al., 1999; Ringstad & Szameitat, 2000)
Operational Knowledge & Mental Models
Exploration (Learning Reviews) & Experimentation (Game Days / Chaos)

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Set Context

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Discovery requires curiosity

We are here to LEARN
Extract Reality

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Invite a broad and diverse group to the conversation

Ask deeper questions (not just “why”)
Allow For Time
Spread the conversation out

Allow for reflection and synthesis

(themes, narrative details, actionable takeaways)
No Pain

No Gain
Game Days
Decrease Blind Spots
Increase Knowledge & Mental Models
One Last Thing...
I, I don't want to move mountains
I like them just
Where they are

I, I want to lift the curtains
From my heart, from your heart

- Bonnie Paine (Elephant Revival) - “Will Carry On”
Thank You