

A Sensemaking Experiment

Techniques towards achieving Cognitive Precision

Gary Klein (Klein Associates)

Dave Snowden (Cognitive Edge)

Cheryl Ann Teh (MINDEF, Singapore)

Chew Lock Pin (DSTA, Singapore)



Sensemaking Experiments

Experiment objectives

1. Demonstrate inherent failures in Sensemaking at individual and group levels
2. Assess effectiveness of a range of interventions on Sensemaking abilities, specifically cognitive precision.

Some definitions...

- **Sensemaking** - People, processes and systems to exploit information - under conditions of complexity, uncertainty, and time pressure - for awareness, understanding and planning, to make faster and better decisions against an adaptive adversary.
- **Cognitive Precision** - Connecting the “right dots” to arrive at the most precise answer.



Key Sensemaking Problems

Desired Outcomes

Concept Solutions

Environment

Uncertainty

Adaptive Adversary

Time Pressure

Complexity

Organisation

Insensitivity to Weak Signals

Structured for Known/Knowable World

Compartmentalised Knowledge

Team

Skewed Decision Making

Team process losses

Individual

Biases

Physical and affective influence
- Hunger, fatigue, fear, etc

Cognitive Limitations
- Perception, attention, memory

Adaptivity

Reducing Sensemaking demand; enabling CAS

As One

Becoming a "small" Large Unit

Reliable Instincts

Harnessing Gut and Guts

Augmented Cognition

Supplementing intrinsic Cognition

Rapid Cognition

"Getting It" Fast!

Cognitive Precision

"Getting it" Right!
Connecting the right dots

On-the-fly

Dynamic processes and organisation

Cognitive Agility

Individuals and teams
Switch frames with ease

See/ Operate as One
"Common Reference"

RPDM training system

Experience training with adaptive enemies

Experts on Demand
Social Networks on the Fly

'One Glance' upload
Rapid understanding

'Short & Sharp' Download
Expedient Comms

Enhanced Reasoning
Sharpen the Thinking Processes

Massive Sensemaking
Data finds data; Relevance finds users

Adaptive Systems

System Automated to adapt

In Parallel

Creating Time

Human-Machine Symbiosis

Adapt to human cognition

Persistent Sentinels

Always reliable vigilant agents

Virtual Assistants

Digital Assistants

Uncertainty reasoning

Hypothesis falsification

EBO/ABIDE

RPDM

Teamsight

Wisdom of the Rest

Extracting insights from large numbers

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Structured for
Known/Knowable World

Compartmentalised
Knowledge

Team

Skewed Decision Making

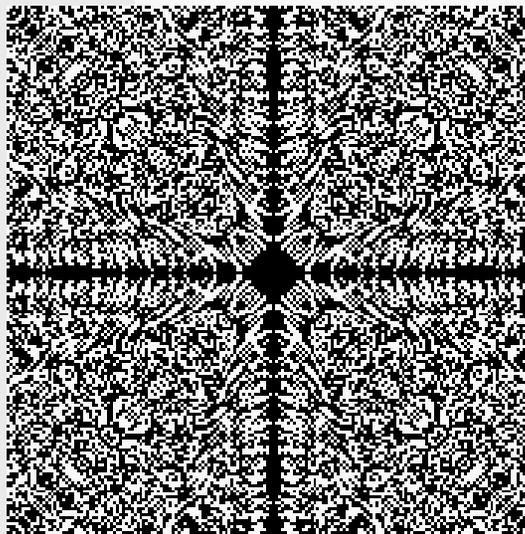
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Cognitive Precision

“Getting it” Right!

Connecting the right dots

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Enhanced Reasoning Sharpen the Thinking Processes



Popper



Klein



Snowden

Team

Skewed Decision Making

Team Losses

Individual

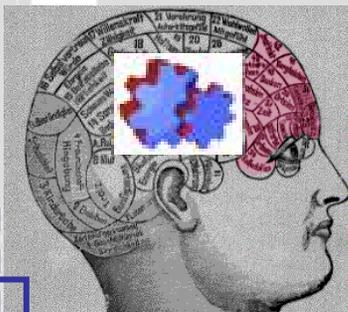
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Cognitive Precision

"Getting it" Right!
Connecting the right dots

Level of
Uncertainty

Uncertainty Reasoning, ABIDE

No Frame (or Hypothesis) available

Hypothesis Falsification, ABIDE, TeamSight

Chaos

Many Possible Frames

RPDM

Complex

Few Frames

Knowable

One Frame

Known

Fog of War

Time

Obstacles to cognitive precision



Individual Cognitive Biases

- Effect of Mental Models
 - Confirmation Bias
 - Ignoring discrepant information
- Expectations
- Heuristics of judgment
 - Availability
 - Representativeness.
 - Adjustments and Anchoring
- Overconfidence

Group Behaviour

- Groupthink
- Group polarization
- Group risk-taking

Organizational Obstacles

- Compartmentalized Knowledge (Stovepiping)

Sensemaking Experiments

Weak signal detection

- Manifestation of sensemaking strengths and weaknesses
- Key to cognitive precision
- Tendency for novices, but less so experts, to follow a “Garden Path”^{*}
 - Salient anchors suggest an obvious explanation that is actually inaccurate if subsequent or discarded information is considered
- Causes fixation and hence inability to detect weak signals



* Feltovich et al, 1984; Rudolph 2003

See-Attend-(Share)-Act Model



- *See*: Did anyone notice the weak signals?
- *Attend*: Were the signals taking into consideration?
- *Share* (for group sensemaking): Did individuals convey awareness to the team?
- *Act*: Was awareness translated to action?

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Concept solutions

- Developing new perspectives
 - *Attractor-Barrier Framing*
 - *Future Backward*
 - *Pre-Mortem; Crystal Ball*
- Legitimizing dissent
 - *Ritualized dissent*
 - *SA Calibration*
 - *Crystal Ball*
- Breaking down information stovepipes
 - *Ritualized Dissent*

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Attractor-Barrier Framing

- Part of ABIDE model developed by Cognitive Edge
- Allows user to describe situation efficiently at a higher level of abstraction from reality
- Focus on aspects of situations – attractors and barriers – that can be changed and are tangible
- Can be framed from different perspectives – own, enemy
- Works best when describing situation of future uncertainty
- Explained through metaphor



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Ritualized Dissent



- Developed by Cognitive Edge to overcome problems of pattern entrainment and groupthink.
- While seemingly identical to Devil's Advocate techniques, differs in that everyone goes through the same process simultaneously before taking turns critiquing others' plans. Provides insider view.
- Encourages exposure of flaws in own argument through forming critique of others, leading to revision of own argument for greater robustness.

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Crystal Ball & Pre-Mortem



Crystal Ball originally developed by Marvin Cohen to enable constructive criticism of assessment, either at individual or group level.

- Told that initial assessment of situation is wrong, made to come up with alternative assessments based on given situation
- Compels team members to think differently
- Pre-mortem focuses on uncovering potential critical flaws in assessment or plan.

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SA Calibration

- Elicit individual and team situation understanding at various points in time.
- Individuals to answer following 5 questions:
 - What is the immediate goal of your squad/team?
 - What are you doing to support this goal?
 - What are you concerned about?
 - What is the current threat location, size and intention?
 - What do you think the situation will look like in x amount of time and why?
- Team leader then facilitates group discussion based on individual responses.



The Experiment

Sensemaking Experiments

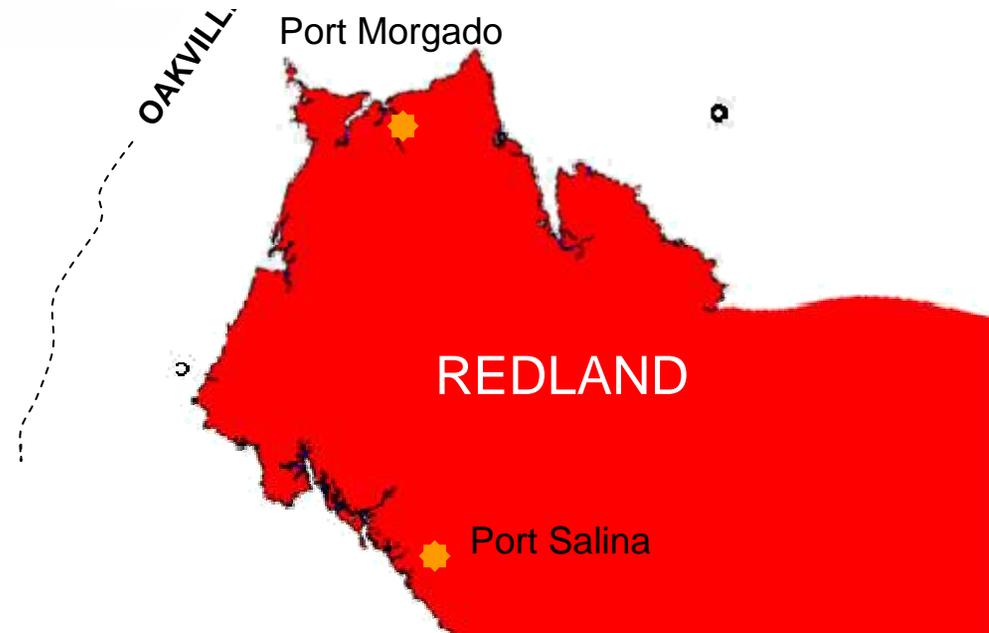
SCENARIO #1 - Military Planning

Task (Strategic/Operational)



You are a planning team for CDF. With your team, develop a broad plan of operations for the BAF. Consider:

- What is REDLAND likely to do?
- What is the Mission for BAF?
- What is the broad plan for BAF? What type of support is needed?
- What are the Criteria of Success for BAF?



SCENARIO #2



Homeland security threat assessment

- Provided with intelligence from multiple sources regarding imminent terrorist threat; conflicting/ insufficient/ misleading info on nature, location, time/date
- Realistic - modified from scenario developed by National Security Coordination Centre
- 3 month time frame played over 3 hrs, with injects given ~ every 5 minutes

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Data collection

1. Narrative capture
 - Anecdotes
 - Indexing
2. Assessment Questions
 - What do you think you might have missed the first time round?
 - What insights did you gain after the intervention(s)?
3. SA Calibration
4. Naturalistic observations

Findings

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Seeing the Data

- Certain individuals were particularly good at spotting weak signals early.
 - Indicated by narrative capture data.
 - Individual aptitude.
- Alternative reasoning through Crystal Ball brought subjects closer to reality.
 - In scenario #2, subjects were able to pick up weak signals suggesting incident was to take place on National Day

Attending to the data

- AB Framing from various perspectives - own, enemy, neutral - facilitated better understanding of the situation.
 - Discussions following AB Framing showed consideration of alternative courses of action.
- Contemplation of previously unconsidered scenarios through Future Backward and Crystal Ball interventions.

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Sharing the data

- Groupthink
 - Individual opinions did not always emerge in group discussions or plans – evidenced by narrative captures, although teams appeared well-calibrated in SA calibration measures.
- Level of debate increased especially after Future Backward and Ritualized Dissent interventions.

Acting on the Data



- Spectrum of behavior observed:
 - 2 teams actively revised their plans to build in more contingencies, following Ritualized Dissent intervention
 - 1 team did not acknowledge that appointed “Red Team” (in variation of Ritualized Dissent) had opposed their plan in several ways, felt that critique was in line with original plan.
- Hardest to influence, easiest to observe?

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Anticipatory Thinking



- Experiment was a pilot attempt to investigate anticipatory thinking behavior in small teams.
 - Found that interventions introduced into the Sensemaking process enhanced cognitive precision, as manifested in improved weak signal detection.
- Anticipatory thinking in individuals and teams
 - More functional than prediction – focuses on preparation for future events
 - Aimed at potential events including low-probability high threat, not simply the most predictable events.
 - Premised on *weak signal detection*.
- Solutions to improve anticipatory thinking:
 - Encourage dissent to reduce fixation
 - Increase expertise, abstract situation to improve weak mental models
 - High Reliability Organizations to break down organizational barriers

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Ongoing Work

- Further validation of interventions on TRIGGER, a sensemaking experimental platform
 - Hypothesis falsification technique
- Intuitive thinking as a complement to analytical reasoning

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Thank You

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