THE KNOWLEDGE STRUCTURE OF THE COMMANDER IN ASYMMETRIC BATTLEFIELD: THE SIX SIGHTS AND SENSEMAKING PROCESS

Celestine A. Ntuen, Ph.D
Distinguished University Professor
The Army Center for Human-Centric C2 Decision Making
ntuen@ncat.edu
http://gandalf.ncat.edu/ihms
+1-336-334-7780 (X531): phone
+1-336-334-7729: fax
Presentation Outline

1. INTRODUCTION
2. THE COMMANDER’S KNOWLEDGE STRUCTURE
3. THEORETICAL RATIONALE & EMPIRICAL SUPPORT
4. THE COMMANDER’S ‘SIGHTFUL’ KNOWLEDGE
5. A CASE STUDY
6. SUMMARY & CONCLUSIONS
Why Sensemaking?
Situation Understanding

Iraqi Problems
• Insurgency
• Terrorism
• Civil Unrest
• Ethnic Rivalry
• Weapon of Mass Destruction
• Despotic Leadership

Adversary Characteristics
Dynamic, Uncertain, Chaos, Complex, Novel, Ambiguous, Asymmetric

Solution Approach
• Political
• Economic
• Military
• Social
• Information
• Infrastructure

Enemy Or Friend?
Why Sensemaking? Dealing with Novel Situations

Experience Schema

Lessons Learned (Organizational Memory)

Cultural factors

Battlefield Factors

Mission
Enemy
Terrain
Time
Technology

Field Knowledge

Training

Individual Or group

National security
Stability
Collectivism

Strategic culture

Organizational culture

Social Economic Bureaucracy

Tactical & Operational culture

Prejudice
Uncertainty
Rules of engagement

MET3

Power distance
Power struggle
Conflicts

Political culture

POW: Self Dignity and Respect

The unknown enemy

Ethnocentric Battle Experience

Domain for Military Training & Simulation

The peace keeping soldier
Why Sensemaking?
Information Equivocality—Multiple Meanings and Interpretations

Peace
Symbol
USA
Iraq
Cowardice
We want peace
Why Sensemaking?
Interpreting Commander’s Intent
WHAT IS SENSEMAKING?

Sensemaking: A process, design, or techniques of fusing information in context to derive understanding.

Making Sense: The art or science of making meaning and/or interpreting information in context for decision making.
Some Sensemaking Definitions


2. A SYSTEM OF ACTIONS, SYMBOLS AND PROCESSES THAT ENABLES AN ORGANIZATION TO TRANSFORM INFORMATION INTO VALUED KNOWLEDGE WHICH IN TURN INCREASES ITS LONG-RUN ADAPTIVE CAPACITY – (Schandt, 1997; pp. 8)
Some Sensemaking Definitions

3. A THEORY AND A PROCESS OF HOW PEOPLE REDUCE UNCERTAINTY OR AMBIGUITY; SOCIAлы NEGOTIATE MEANING DURING DECISION MAKING ----(Weick, 1985)

Some Sensemaking Definitions

5. COLLECTING “DOTS” and BRIDGING MEANING TO HUGE VOLUME OF DATA---INQ-Tel (Arlington-based company).

6. DERIVING MEANING FROM FRAGMENTARY CUES--(DARPA’S Information Awareness Project).
Our Sensemaking Inquiry System Research Architecture
"In a world that is complex and unknowable, sensemaking is all there is." (Reuben McDaniel)
The Commander’s Knowledge Structure

Information Abstraction
DOD’s Intelligence
Preparation of Battlefield

Physical Structure

Information Structure

Cognitive Structure

Intuition
Introspection
Meta-cognition
Insight
Hindsight
Foresight
Oversight
Short-sight
Outsight

How the Commander’s Knowledge Structure Is Formed in the Battlefield

Cognition

Extrinsic/Intrinsic attractors

Perception

Enables

Receives

References

Civil / Political

Economic

IED: Adversary Weapon

Insurgent Army

Self

Or System

attractors

Economic

Civil / Political

THEORETICAL RATIONALE AND EMPIRICAL SUPPORT

KLEIN (1988):
- Power of Intuition
- Mental Simulation
- Metaphor
- Story Telling

Theory of Expertise (Chi, Simon; 1981; Adelson, 1984; many others):
- Product of experience
- Training
- Skill, ability, knowledge
- Competency, Proficiency

Situated Acts (Suchman, 1987)
- Situational factors
- Task complexity
- Uncertainties
- Cognitive codes in the mind

Schema Theories (Hintzman, 1976)
- Cognitive codes in the mind
- Storehouse of experience
- Daily coping (Functional)
- Atypical beliefs (Cognitive)
- Meta-cognitive codes (Contextual)

Pirolli & Card Model:
INFORMATION → SCHEMA → INSIGHT
Hindsight: The commander relies in hindsight—elements of experiential knowledge; lessons-learned data; “I have seen this before syndrome”

Foresight: The commander attempts to project his knowledge into the future through envisioning, anticipated (expected goals). A product of mental simulation

Insight: The commander relies on tacit knowledge—”knowing more than he can tell;” the “aha” experience

Outsight: The commander looks for outside information to confirm his believes—HUMINT, SIGMINT, etc. “What is happening out there syndrome”

Oversight: The commander overestimates/underestimates situation—unintentional omission or mistake.
### Table 1. The summary of “sighted” knowledge and their applications

<table>
<thead>
<tr>
<th>Sighted (cognition)</th>
<th>Knowledge Type</th>
<th>Explanations/ Applications</th>
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<tbody>
<tr>
<td>Foresight</td>
<td>Fore knowledge</td>
<td>Envisioning, forecasting, anticipating, and predictive causal maps for situations and/or events. Applied to anticipatory planning, goal expectations and intents; perceiving dimensions of system failures at the conceptual stage; Useful in constructive (predictive) simulation models for future system state analysis and preparedness planning.</td>
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<td></td>
<td>Predictive knowledge</td>
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<td></td>
<td>Mental simulation</td>
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<tr>
<td>Insight</td>
<td>Tacit knowledge</td>
<td>Supports meta-cognition using experience-based mental models, cognitive maps, and heuristics generated from experiential knowledge. Useful in constructing mental simulation models for explorative/proof-of-concept on expertise; Derivative knowledge of familiar situations embodied in ego-centric goal description – intentional knowledge explications.</td>
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<td></td>
<td>Lessons-learned knowledge embodied in historicity</td>
<td>Heavily bounded on reflexive knowledge of past events. Long-term memory plays a major role.</td>
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<tr>
<td><strong>Hindsight</strong></td>
<td></td>
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<tr>
<td><strong>Oversight</strong></td>
<td>Diagnostic knowledge</td>
<td>There is an overshoot caused by the gap in knowledge between reality and model-based situation assessment. The interest is to diagnose causes and consequences of error during the sensemaking process. Gap analysis, error correction, and feedback. Helps in diagnosing causes and consequences of errors during sensemaking process.</td>
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<td>Short-sight</td>
<td>Myopia knowledge</td>
<td>Spatio-temporal reasoning and planning; short cycle system analysis; short-term goals and plans; lacks the vision of a big picture—leading to constraints and bottle-necks or strategic errors.</td>
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<td>Outsight</td>
<td>Ecological knowledge</td>
<td>Thinking outside of the box. Uses all forms of doctrines, procedures, and intelligent—HUMINT, SIGMINT, and so on to determine adversary terrain information.</td>
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</table>
The Sighted Commander

Avoid the Route of most IED

Situation: Shooting at mosque near Al Kut
Mental Simulation
1. IED on frequent route
   1. 85-95%
2. Time: After mosque on Fridays;
   Occasionally during social events
3. Likely deceptive shooting
4. Engage the local police
RELEVANCE OF SIGHTFUL KNOWLEDGE TO THE CASE

1. What is the specific event or fact observed? OUTSIGHT

2. What does it mean to you? INSIGHT

3. How much familiarity to this event or situation? HINDSIGHT

4. Should the Iraqi security be sent to control the situation? OVERSIGHT / SHORT-SIGHT
### Selected Problem Situation

<table>
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<tr>
<th><strong>Problem analysis:</strong> Constructing a problem representation</th>
<th>Sighted Knowledge Influence</th>
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<tr>
<td><strong>Conceptual analysis:</strong> Using primitive concepts to reconstruct meaning</td>
<td>Hindsight; Short-sight.</td>
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<td><strong>Representational analysis:</strong> Determining different ways of interpretation and meaning assignment</td>
<td>Oversight; Short-sight.</td>
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<td><strong>Complex analysis:</strong> reducing problem to manageable size and applying heuristics that ignores complexity—make sense of complexity and chaos</td>
<td>Insight; Hindsight; Short-sight</td>
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<td><strong>Comparing and contrasting evidence:</strong> Identifying patterns based on qualitative/quantitative similarity metric</td>
<td>Hindsight; Oversight.</td>
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<td><strong>Interpreting situations</strong>: For example, using object location in maps to determine enemy position or dangerous zone.</td>
<td>Outsight; Hindsight; Insight.</td>
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<td><strong>Self evaluation</strong>: Such as evaluating one’s performance, or identifying bottlenecks in problem situations.</td>
<td>Insight; Oversight.</td>
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<td><strong>Self-awareness</strong>: Determining physical, informational (symbolic) and cognitive states and their risks during combat.</td>
<td>Insight; Hindsight; Outsight; Short-sight.</td>
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1. THE COMMANDER IS AN INTUITIVE STATISTICIAN (Peterson, 1967).
2. THE COMMANDER HAS SIGHTFUL KNOWLEDGE STRUCTURE:
   1. Intuition
   2. Instincts
   3. Introspection
   4. Expertise and Experience
   5. Situation / Contexts
   6. Knowledge Representation thru Schema
3. AT LEAST SIX SIGHTFUL KNOWLEDGE IS DOMINANT:
   (a) INSIGHTS—Tacit knowledge
   (b) HINDSIGHT—Past experience
   (c) FORESIGHT—Envisioning and projection of situated knowledge
   (d) SHORT-SIGHT—Myopia knowledge, short-term planner
   (e) OVERSIGHT—Overestimation/Underestimation; Error feedback
   (f) OUTSIGHT—Ecological knowledge—what we see out there is important to what we know in there (Gibson, 1969)