

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

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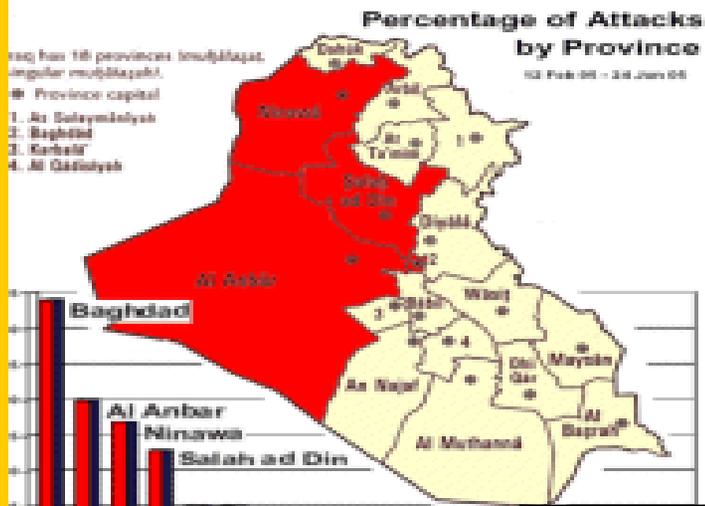
Presentation Outline

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



Solution Approach

- Political
- Economic
- Military
- Social
- Information
- Infrastructure

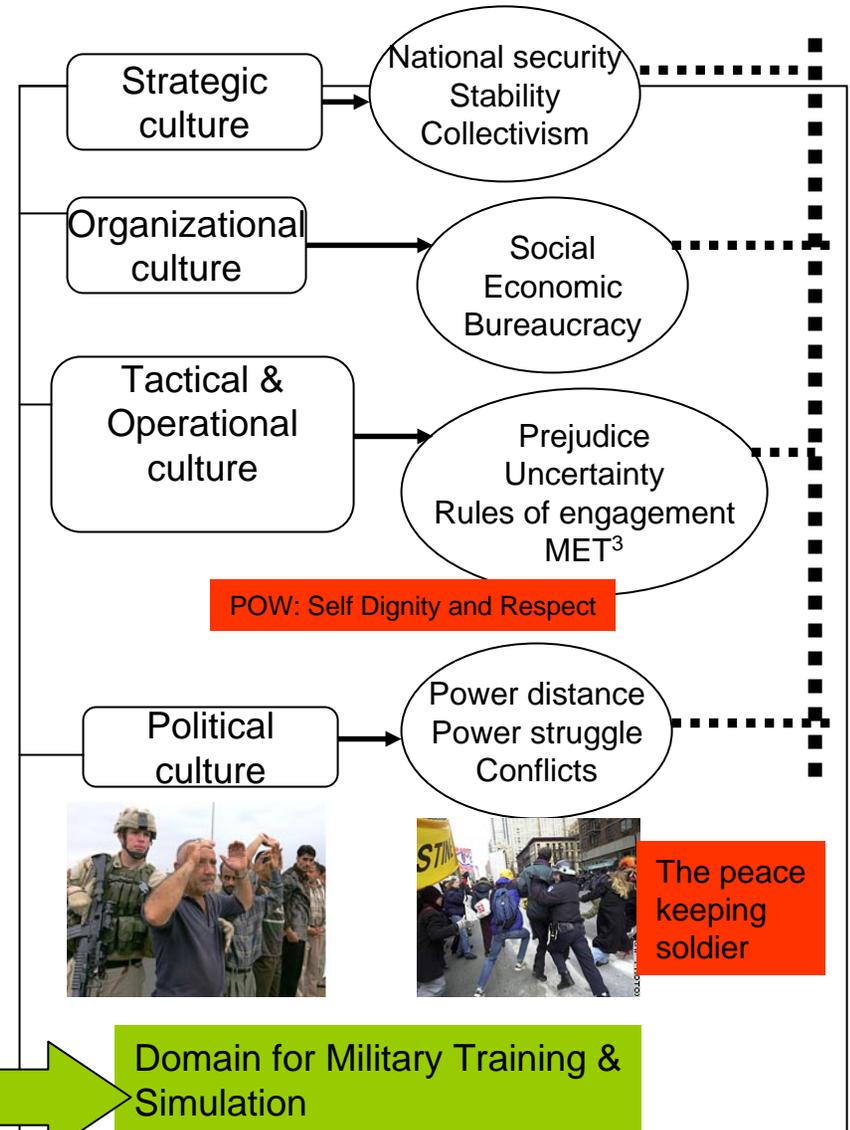
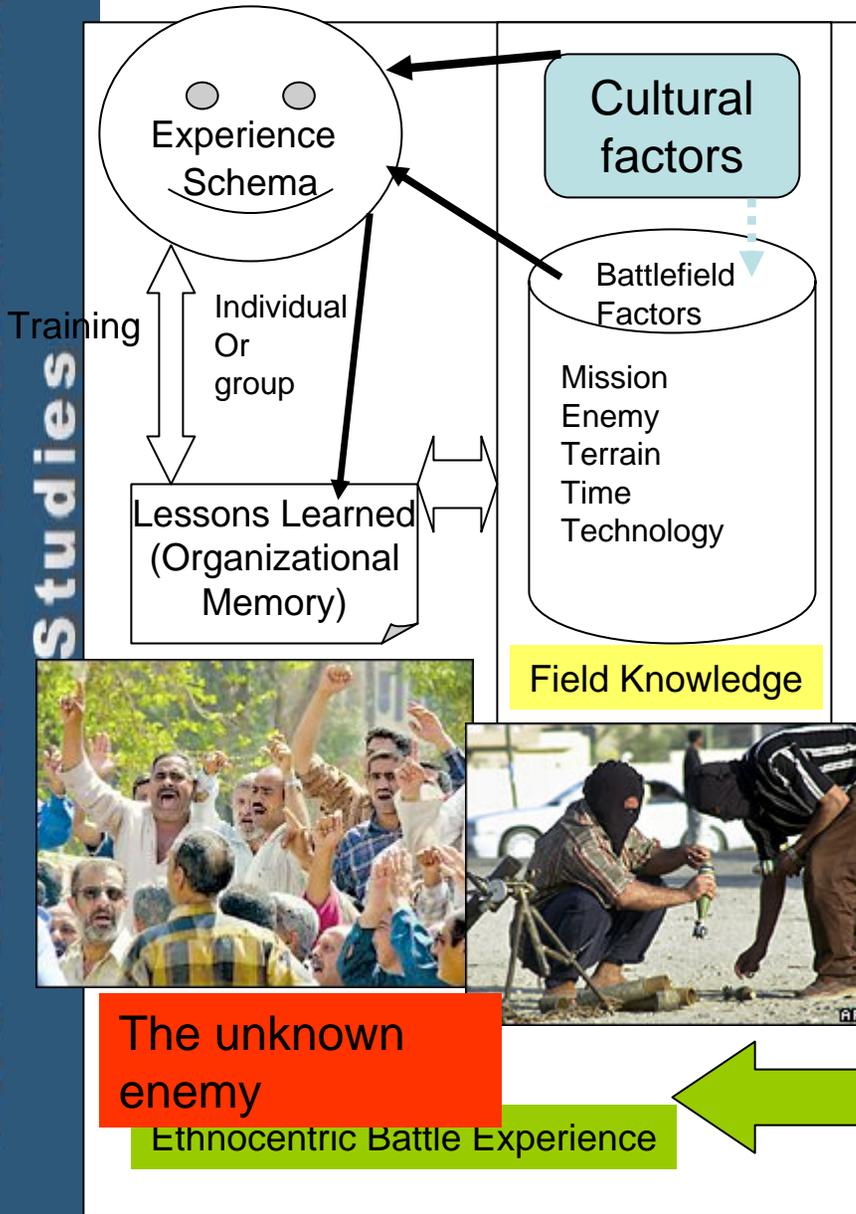
Adversary Characteristics

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



Enemy
Or
Friend?

Why Sensemaking ? Dealing with Novel Situations



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

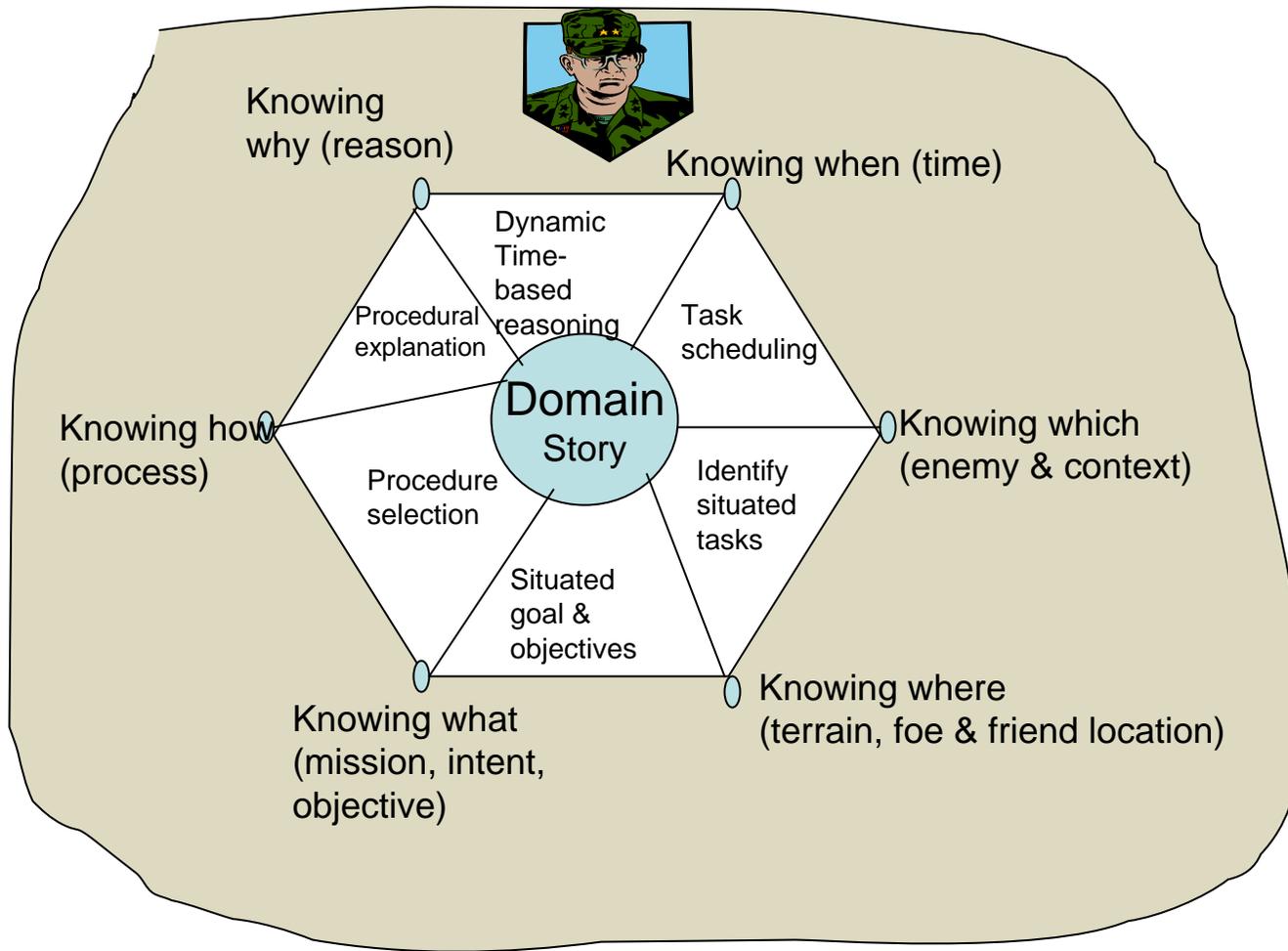
1. HOW MEANING IS CONSTRUCTED AT BOTH THE INDIVIDUAL & THE GROUP LEVELS – (Weick, 1995).
2. A SYSTEM OF ACTIONS, SYMBOLS AND PROCESSES THAT ENABLES AN ORGANIZATION TO TRANSFORM INFORMATION INTO VALUED KNOWLEDGE WHICH INTURN INCREASES ITS LONG-RUN ADAPTIVE CAPACITY – (Schandt, 1997; pp. 8)

Some Sensemaking Definitions

3. A THEORY AND A PROCESS OF HOW PEOPLE REDUCE UNCERTAINTY OR AMBIGUITY; SOCIALLY NEGOTIATE MEANING DURING DECISION MAKING
----(Weick, 1985)
4. ARTICULATING AND POSSIBLY CONTESTING THE MEANING AND SIGNIFICANCE OF AN ARTIFACT OR IDEA –(S.B. Shum & A. M. Selvin, In Distributive Collective Practices 2000: www.limsi.fr/WkG/PCD2000)

Some Sensemaking Definitions

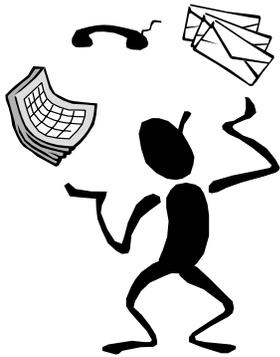
5. COLLECTING “DOTS” and BRIDGING MEANING TO HUGE VOLUME OF DATA---
INQ-Tel (Arlington-based company).
6. DERIVING MEANING FROM FRAGMENTARY CUES–
(DARPA’S Information Awareness Project).



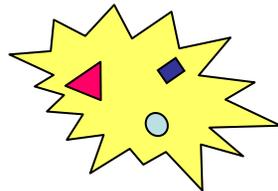
Our Sensemaking Inquiry System Research Architecture

- “In a world that is complex and unknowable, sensemaking is all there is.” (Reuben McDaniel)

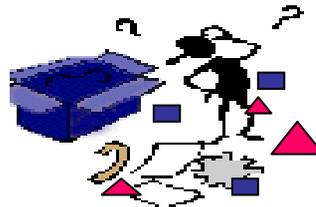
Reality



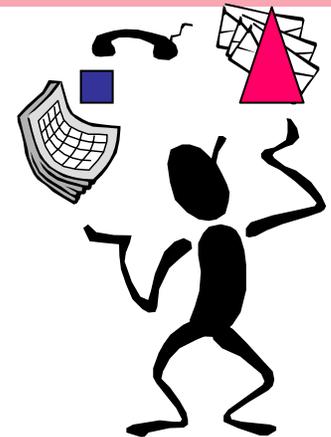
Unexpected



Retrospection

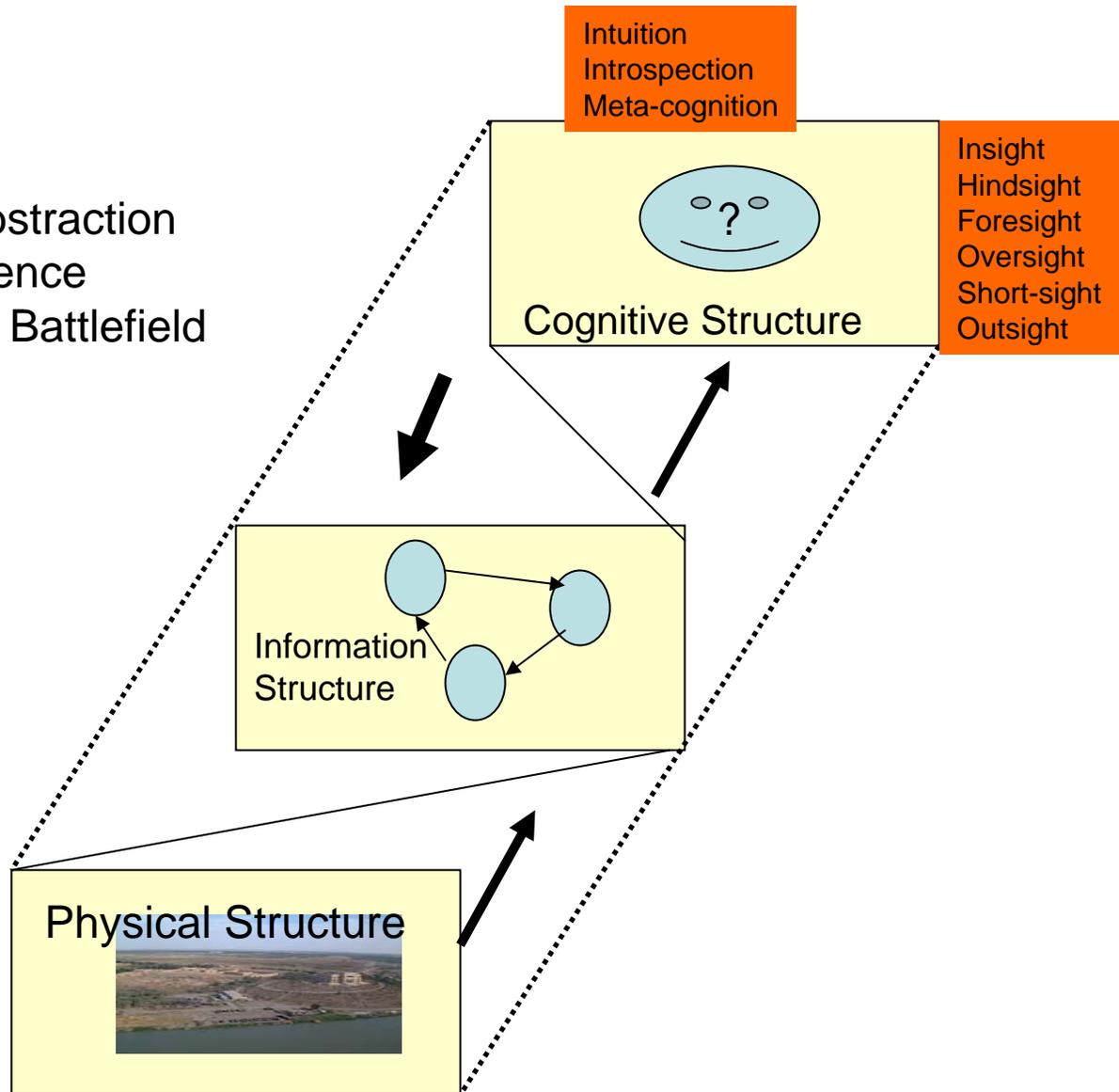


Reality Creation



The Commander's Knowledge Structure

Information Abstraction
DOD's Intelligence
Preparation of Battlefield



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

Civil / Political

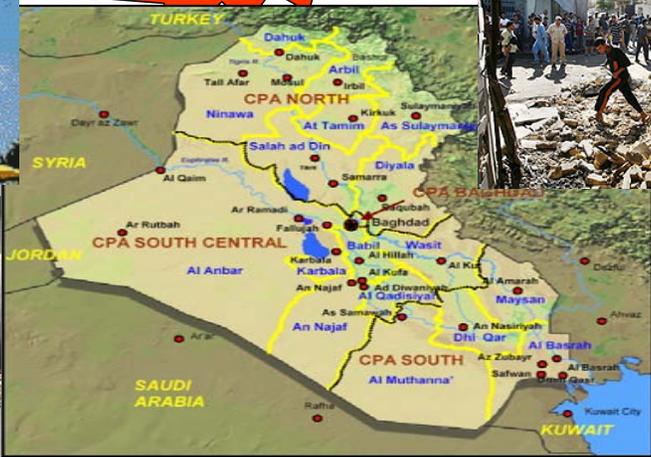
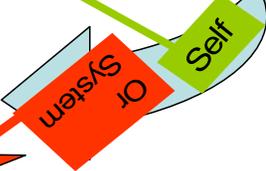
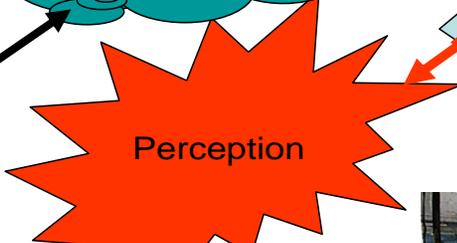
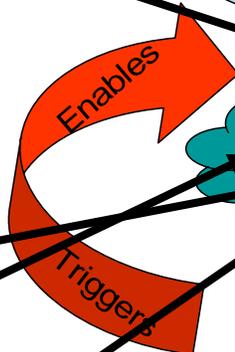
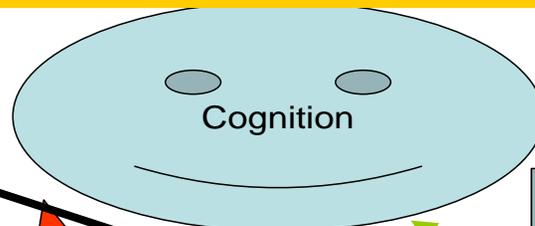


Economic

IED: Adversary Weapon



Insurgent Army



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

THE COMMANDER'S SIGHTFUL KNOWLEDGE

Hindsight:

The commander relies in hindsight—elements of experiential knowledge; lessons-learned data; “I have seen this before syndrome”

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 beliefs—HUMINT, SIGMINT, etc. “What is happening out there syndrome”

Foresight:

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

Short-sight:

The commander relies on short-term goals; Lacks discernment or long-range planning perspective.

Oversight:

The commander overestimates/ Underestimates situation—unintentional omission or mistake.



The Adversary

Table 1. The summary of “sighted” knowledge and their applications

Sighted (cognition)	Knowledge Type	Explanations/ Applications
Foresight	Fore knowledge Predictive knowledge Mental simulation	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.



Insight	Tacit knowledge	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.
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Hindsight	Lessons-learned knowledge embodied in historicity	Heavily bounded on reflexive knowledge of past events. Long-term memory plays a major role.
Oversight	Diagnostic knowledge	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.



Short-sight	Myopia knowledge	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.
Outsight	Ecological knowledge	Thinking outside of the box. Uses all forms of doctrines, procedures, and intelligent—HUMINT, SIGMINT, and so on to determine adversary terrain information.



The Sighted Commander

Route for most IED

Avoid the Route of most IED

Mosque

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	Sighted Knowledge Influence
Problem analysis: Constructing a problem representation	Insight; Oversight.
Conceptual analysis: Using primitive concepts to reconstruct meaning	Hindsight; Short-sight.
Representational analysis: Determining different ways of interpretation and meaning assignment	Oversight; Short-sight.
Complex analysis: reducing problem to manageable size and applying heuristics that ignores complexity—make sense of complexity and chaos	Insight; Hindsight; Short-sight
Comparing and contrasting evidence: Identifying patterns based on qualitative/quantitative similarity metric	Hindsight; Oversight.

<p>Interpreting situations: For example, using object location in maps to determine enemy position or dangerous zone.</p>	<p>Outsight; Hindsight; Insight.</p>
<p>Self evaluation: Such as evaluating one's performance, or identifying bottlenecks in problem situations.</p>	<p>Insight; Oversight.</p>
<p>Self-awareness: Determining physical, informational (symbolic) and cognitive states and their risks during combat.</p>	<p>Insight; Hindsight; Outsight; Short-sight.</p>

SUMMARY / CONCLUSIONS

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

SUMMARY / CONCLUSIONS

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)