



SENSEMAKING TRAINING REQUIREMENTS FOR THE ADAPTIVE BATTLESTAFF

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While wars have become more complex, responsibility for those who fight them has increasingly slipped down the chain of command to junior personnel. Yet these young, inexperienced leaders have little time to prepare themselves to make strategic decisions (General Scales, pp. 8)

Scales, R.H. (2003). *The second learning revolution*. *Military Review*, 37-44.





Presentation Outline

1. INTRODUCTION
2. RELATED DEFINITIONS OF SENSEMAKING
3. WHY TRAIN SENSEMAKING TASKS
4. SENSEMAKING TRAINABILITY FACTORS (STF)
5. STF AT THE INDIVIDUAL, SOCIAL, & ECOLOGICAL LEVELS
6. SOME METRICS FOR TRAINING OUTCOMES
7. SUMMARY & CONCLUSIONS





WHAT IS SENSEMAKING ?

Consider the hypothetical situation:

Unit FRAGO-2 has mistakenly attacked a civilian social event thought to be a potential enemy cell in the SW of Bagdad. It turns out that the group was celebrating the birthday of Imam Mohamed Idris, the sole religious leader of the community. The attack occurred as a result of intelligent citing of insurgent migration and regular meetings near the Imam's mosque and home. Apparently, the bombing by the coalition force has killed the Imam. There is an outrage and mass demonstration of "America Go Home" and "Death to America".

So far, over 200 civilians, mostly the Sunnis have been killed. All forms of civil activities have come to a halt. No transportation in or out of the area, there is no electricity, no water, and the garbage pile up is making the place unlivable. The situation is escalating and moving to other Iraqi cities. Both stability and humanitarian operations are to be initiated by the coalition force commander.





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.





WHAT IS SENSEMAKING ?

HOW MEANING IS CONSTRUCTED AT BOTH THE INDIVIDUAL & THE GROUP LEVELS – (Weick, 1995).

DERIVING MEANING FROM FRAGMENTARY CUES–

(DARPA'S Information Awareness Project)





Why training for sensemaking tasks is necessary

1. Modern battlefields are asymmetric:
 1. training for force-on-force fighting is outdated.
- Battlefield information changes with respect to changing situations:
 1. Equivocality versus scarcity
 2. Uncertain versus unknown





Why training for sensemaking tasks is necessary

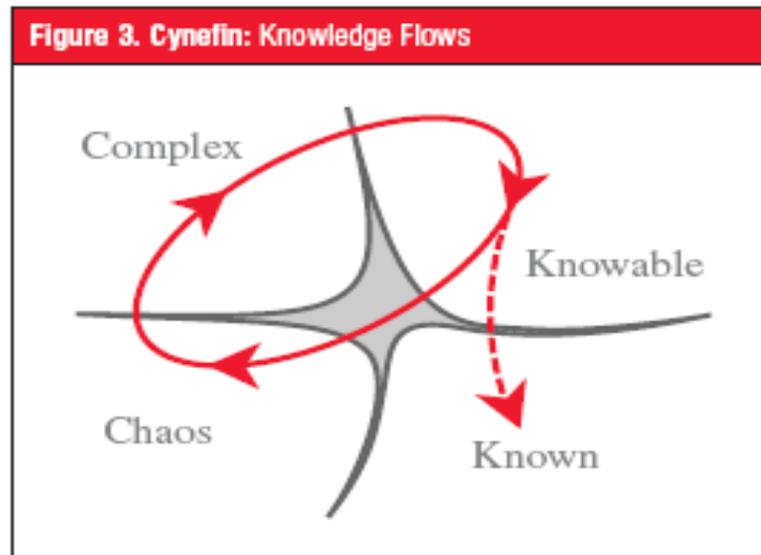
3. Courses of action developed from the traditional deliberate military decision making process rarely survive asymmetric enemy tactics:
 - Needs to train decision makers to think outside the box—move away from linear thinking to nonlinear mind set
 - Learn how to develop plans with improvising capability
 - Recognize opportunities & contingencies.



Why training for sensemaking tasks is necessary

4. Sensemaking tasks are mostly cognitive
 1. Information processing
 2. Evolving along multiple dimensions of task context (see., Cynefin model)

Snowden's categorization of the sensemaking context





Preamble to defining sensemaking tasks

Sensemaking is viewed as a sequence of situated acts.

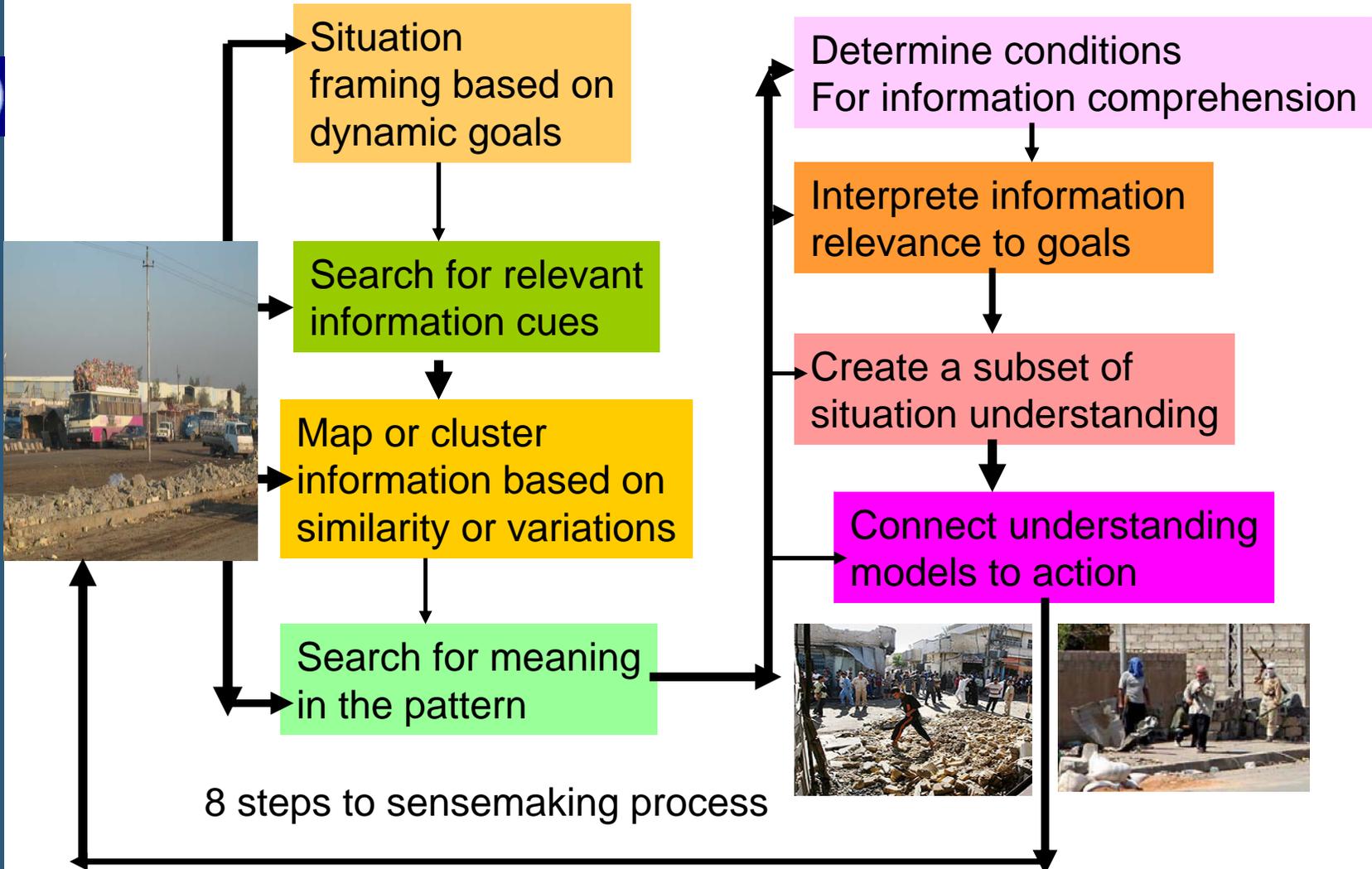
Situatedness: “Where you are, when you do, what you do matters” (Suchman , 1987; Clancey, 1997).

Situation changes: Require adaptive constructive memory (Dietrich & Markman, 2000).



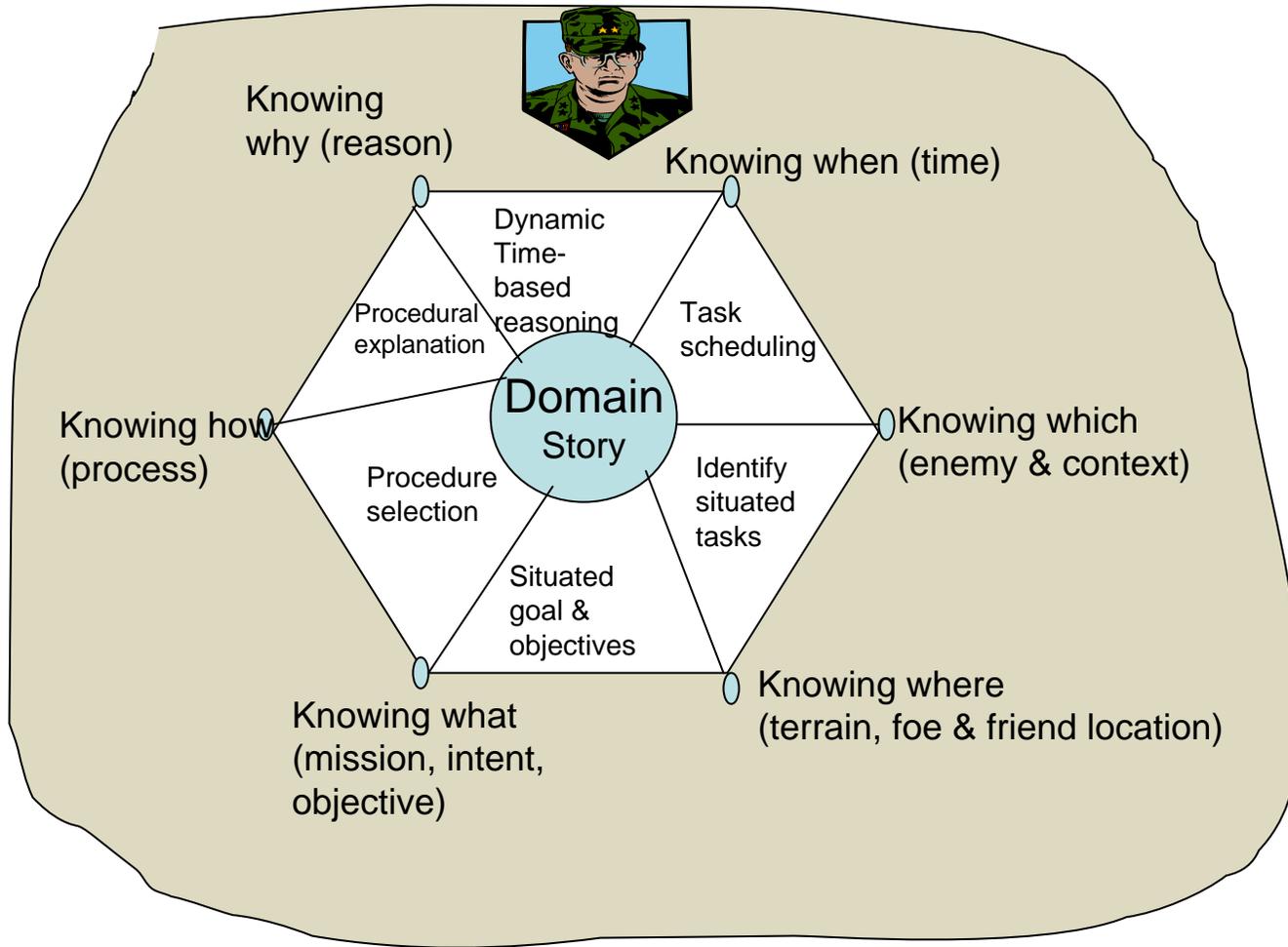


Preamble to defining sensemaking tasks





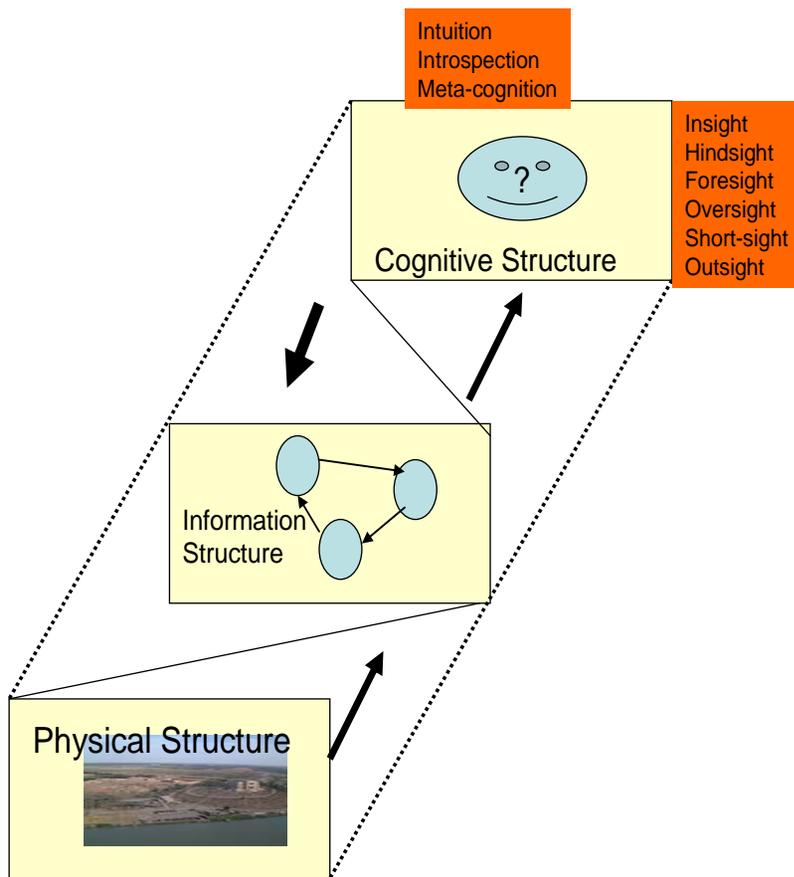
Sensemaking training is enabled by knowledge stratification & inquiry



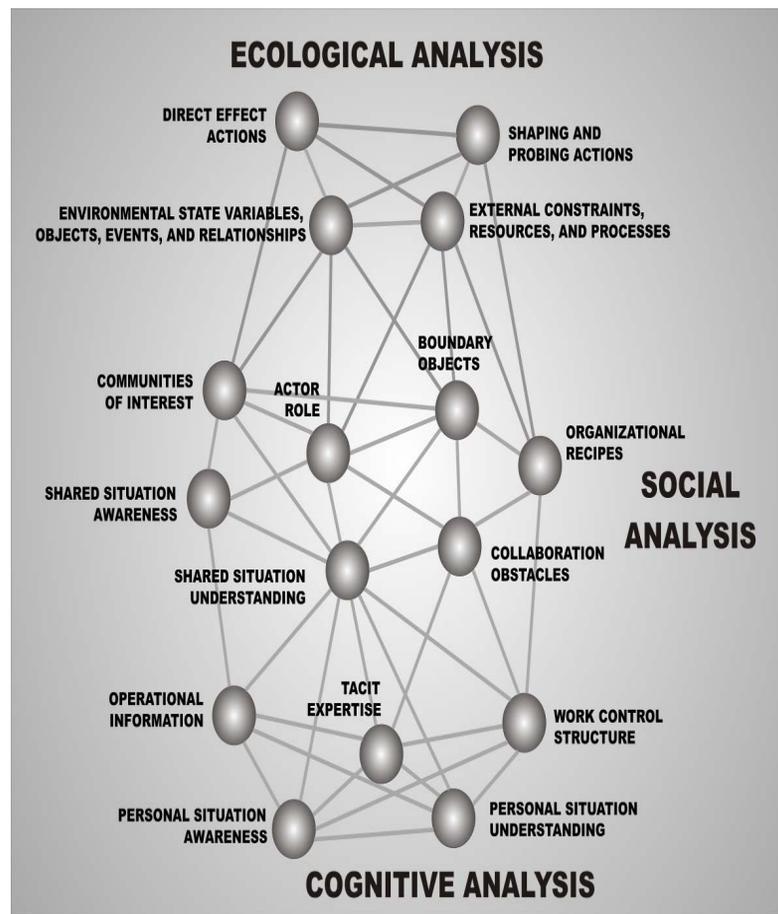
Our Sensemaking Inquiry System Research Architecture



Sensemaking Structure and Influences to Training



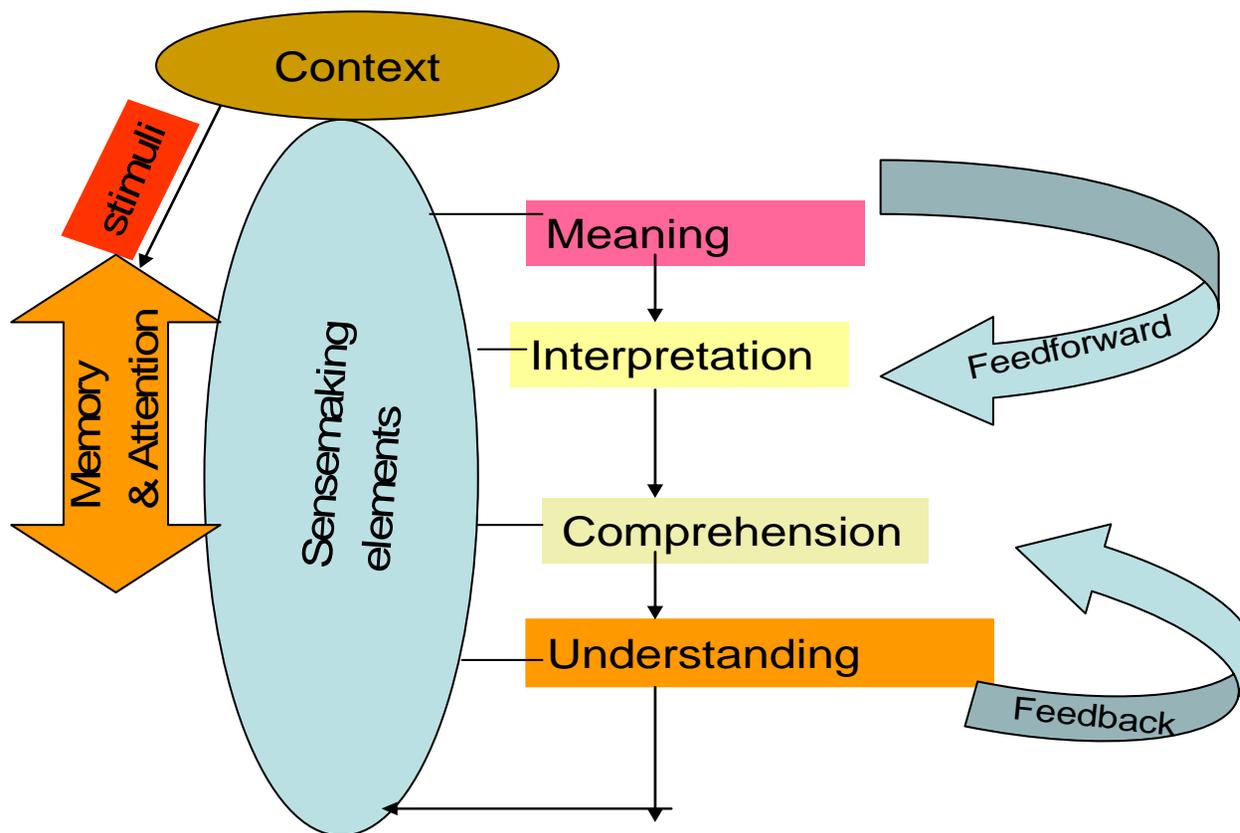
Levels of Battlefield Information Processing



Cognitive, Social, & Ecological Levels of Sensemaking



Sensemaking Structure and Influences to Training



A cognitive abstraction model for a sensemaking process with four meta-tasks (meaning, interpretation, comprehension, and understanding)



Training Sensemaking Tasks

Major Goals:

1. Acquire new perspectives of looking at asymmetric problems
2. Increase knowledge of dealing with complexity and problems with “wicked structures”
3. Clarify attitudes, beliefs and/or behaviors to adapt with agility
4. Improve, transfer, or modify existing skill sets to novel and evolving situations
5. Align sensemaking and decision making to actionable knowledge.





Training Sensemaking Tasks

Classical Trainability Factors:

1. Campbell (1971):
Attitude, motivation, behavior, personality differences
2. Machala (1981):
Aptitude, achievement, competence, socio-economic factors, effectiveness, and communication
3. Peterson & Bownas (1982):
Levels of information processing requirements, mental processes, workload, relationship with others





Sensemaking Trainability Skill Sets at Individual (Cognitive) Level

Attribute	Attribute Description	Sample Cognitive Trainability Factors
Meaning	<ul style="list-style-type: none"> * First level situation conveyance * Intent registration 	<ul style="list-style-type: none"> * Situation framing and contextualization * Situational features recall •Mental model probing
Interpretation	<ul style="list-style-type: none"> * Conception of object or event significant in a situation 	<ul style="list-style-type: none"> * Recognizing salient cues * Performing link analysis * Conducting pattern recognition * Offering explanation to meaning assignment



Sensemaking Trainability Skill Sets at Individual (Cognitive) Level

Attribute	Attribute Description	Sample Cognitive Trainability Factors
Comprehension	<ul style="list-style-type: none"> * Associating contextual features to goals or end-states * Exhibiting the acquisition of larger latitude of knowledge in context 	<ul style="list-style-type: none"> * Using of information in context of goal * Meta-cognition with ordered mental map association to changing situations * Pattern discovery/ recognition * Case-based reasoning



Sensemaking Trainability Skill Sets at Individual (Cognitive) Level

Attribute	Attribute Description	Sample Cognitive Trainability Factors
Understanding	<ul style="list-style-type: none"> * Thorough grasp of situation * Latitude of judgment * Expandable lens in looking at situation Knowledge in use 	<ul style="list-style-type: none"> * Deriving the significant of situation * Explaining the effect of action enactment * Reacting to evolving situation with information changes
Mind Sets	<ul style="list-style-type: none"> * Adaptivity * Agility * Flexibility 	<ul style="list-style-type: none"> * Ambidexterity in executing tasks * Fitting contexts to multiple lens * Changing viewpoints to new situation * Applying reflexive knowledge * Opening to “global” cultural viewpoints





Sensemaking Trainability Skill Sets at Individual (Cognitive) Level

Attribute	Attribute Description	Sample Cognitive Trainability Factors
Awareness	Self awareness	<ul style="list-style-type: none"> * Understanding of what is important to you * Understanding how you experience things * Knowing what you want * Knowing how you feel and * Knowing how you come across to others
Sightful knowledge	<ul style="list-style-type: none"> * Insight * Hindsight * Foresight * Short-sight * Oversight * Outsight 	<ul style="list-style-type: none"> * Using experiential knowledge * Anticipating and projecting “senses” into the future * Knowing more than you can tell (tacit knowledge) and tell others what you know (explicit knowledge) * Identifying discernment or long-range proactive plans * Identifying unintentional omissions, mistakes (overestimation or underestimation of opportunities) <p>Thinking outside the box—respond to evolving and novel situations.</p>





Sensemaking Trainability Skill Sets at Organizational (Social) Level

Attribute	Attribute Description	Sample Cognitive Trainability Factors
Shared understanding	<ul style="list-style-type: none"> * Common picture * Context alignment or shared goal * Degree of shared knowledge 	<ul style="list-style-type: none"> * The content (what they work on) * The process (how they work together) * Role (who they work with)
Sense giving	<ul style="list-style-type: none"> * Influence on each other * Shared sense and perception 	<ul style="list-style-type: none"> * Common sensemaking patterns over a long time period * Common frame of reference * Interpersonal connections * Interpretive roles





Sensemaking Trainability Skill Sets at Organizational (Social) Level

Attribute	Attribute Description	Sample Cognitive Trainability Factors
Trust	<ul style="list-style-type: none"> * Familiarity of team members * Belief differences * Viewpoint differences * Differences in aspiration levels * Integrity of team members 	<ul style="list-style-type: none"> * Viewpoint compression * Common negotiation metric * Bias minimization * Reliability of team members with respect to information sharing
Communication	<ul style="list-style-type: none"> * Information sharing * Idea sharing 	<ul style="list-style-type: none"> * Making tacit knowledge explicit * Frequency of communication * Willingness to share information
Organizational Factors	<ul style="list-style-type: none"> * Organizational design (e.g. hierarchy versus distributive) * Influence * Power structure * Culture. 	<ul style="list-style-type: none"> * Status quo versus change * Group value optimization * Ambidexterity * Interpersonal sensitivity.





Sensemaking Trainability Skill Sets at Ecological (Field) Level

Attribute	Attribute Description	Sample Cognitive Trainability Factors
Awareness	<ul style="list-style-type: none"> * Situation awareness * Self awareness * Organizational awareness 	<ul style="list-style-type: none"> * Recognizing what is around you * Seeing things in individual, cultural and group lenses * Influence of organizational rules, doctrines, standard operating procedures
Spatio-temporal Factor	<ul style="list-style-type: none"> * Location of information (objects, events, activities) * Time * Field effects or ecological niches 	<ul style="list-style-type: none"> * Recognizing changes and dynamicity * Synchronous versus asynchronous behaviors and actions * Synchronizing time and events based on changing goals





Sensemaking Trainability Skill Sets at Ecological (Field) Level



Attribute	Attribute Description	Sample Cognitive Trainability Factors
System edge, boundary, and constraints	<ul style="list-style-type: none"> * Complexity of problem representation (scales and dimensions) * Agitation in system structure and functionality * Chaos—evolutionary changes from states of order to disorders * Entropy—friction during mass-energy exchanges at different levels of system structure or information abstraction * Control structure to avoid traps of instability. 	<ul style="list-style-type: none"> * Understanding problem environment (situation, context) * Terrain objects (e.g., topographical features in an urban environment) * Interaction modalities with multi-heterogeneous entities /agents * Cause-effect analysis: effect-based operations (determining causes, resources to deliver deterrent, and analysis of effects)—in the form of means-end analysis



Sensemaking Trainability Skill Sets at Ecological (Field) Level

Attribute	Attribute Description	Sample Cognitive Trainability Factors
System edge, boundary, and constraints		<ul style="list-style-type: none"> * Recognizing speed of change (direction, location, time) in system so as to enable rapid constructability * Differentiating between order and periodic change * Recognizing “things” that evolve versus simple disorder caused by changes * Transferring knowledge about known situations to knowable, complex, and chaotic situations (Kurtz & Snowden , 2003) * Recognizing general and/or specific emergent properties * Recognizing uncertainty versus ambiguity





Elaboration on Key Training Outcomes

1. Critical thinking:

Reason, conceptualize, analyze, and think out of the box

To think of a thing is just to be conscious of it any way whatsoever

(Dewey, 1939).

Improve rapid decision making in asymmetric battle situations

See Critical thinking elements in Riedel:

www.ari.mil



Elaboration on Key Training Outcomes

2. Situation understanding:

- * Summarizing and understanding the meaning & implications of information in context of emerging tasks.
- * Reducing ambiguous information to actionable knowledge.
- * Visualizing a situation in terms of cues and mental maps (FM3-0, June 2006).



Elaboration on Key Training Outcomes

3. Situation Awareness:

- * Perception of the status, attributes, and dynamics of the individual task-relevant elements in the environment (Level 1, SA);
- * Comprehension of current situation, based on a synthesis and understanding of perceived elements and relevancy of goal (Level II SA);
- * Projection of the future actions in the system, at least in the short-term (Level III SA).



Elaboration on Key Training Outcomes

4. Case-based Reasoning:

- * Correlation matching—how past experiences fit into new situation
- * Mental map—adapting known feature cognates to improvise lapses caused by new situation
- * Adapting experiential/situational rules to new contexts





Elaboration on Key Training Outcomes

5. Knowledge discovery:

- * Extension and projection of experience to discover new information patterns using situational information.
- * Meta-cognition—deep versus compiled knowledge applied to problem diagnosis.
- * Cognitive experimentation—building heuristics or home grown rules for particular problem situations, inferences from statistical trends such as classification and prediction models.





Elaboration on Key Training Outcomes

6. Leadership with adaptive mind sets and ambidexterity:

- * Ability to recognize multiple opportunities and prioritize the essential ones for on-going situation.
- * Ability to be flexible while responding to emerging situations.

Five mind sets (Gosling & Mintzberg, 2003)





Elaboration on Key Training Outcomes

Five mind sets (Gosling & Mintzberg, 2003)

1. The reflexive mind-set:

e.g., Lessons learned, experience, doctrines

2. The analytic mind-set:

e.g., reasoning, comparing, judging, etc.

3. The worldly mind-set:

Pooper (1992): World I—physical structure like terrains, geospatial maps; World II—psychological, personal feelings, motivation, etc; World III—conceptual, human mind, mental models, cognitive maps

4. The collaborative mind-set:

e.g., socialization, information sharing, team cohesion

5. The action mind-set:

e.g., spatiality, temporality, joint, delivering effects, dimensions (e.g., stability ops, humanitarian op, etc).



SUMMARY / CONCLUSIONS

1. A method is developed for training sensemaking tasks
2. It is assumed that sensemaking training factors occur at the cognitive level., even though the sensemaking process may occur concurrently as a three-tier task—cognitive (individual), social (organizational), and ecological.
3. Currently, there is no formalized method to train the soldiers on sensemaking tasks. The information in this paper provides the background for this:
Individual soldiers, teams (platoons, units), and leadership (commanders)