NEXT GENERATION COMMON OPERATING PICTURE

Dennis K. Leedom, Ph.D.
Evidence Based Research, Inc.

Introduction

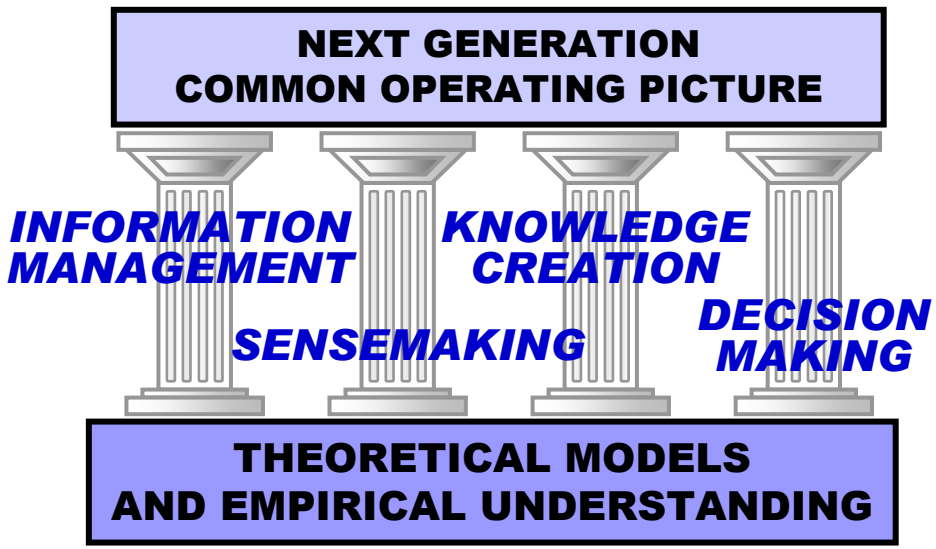
- **Current generation Common Operating Picture motivated by desire to improve situation awareness within a military command organization**
  - *COP consists of both geospatial displays of the battlespace and intranets that extend vertically through several levels*
  - *COP serves as common repository of information for decision makers*
  - *Hypothesis: COP will lead to faster and better synchronized planning and execution decisions*
- **Evidence of success seen in operational and tactical decision making exhibited in Operation Iraqi Freedom, as compared with Operation Desert Storm**
  - *Methodical and efficient destruction of elite Republican Guard Divisions*
  - *Quick-response, precision attack of high-value targets by theater assets*

Future Challenges

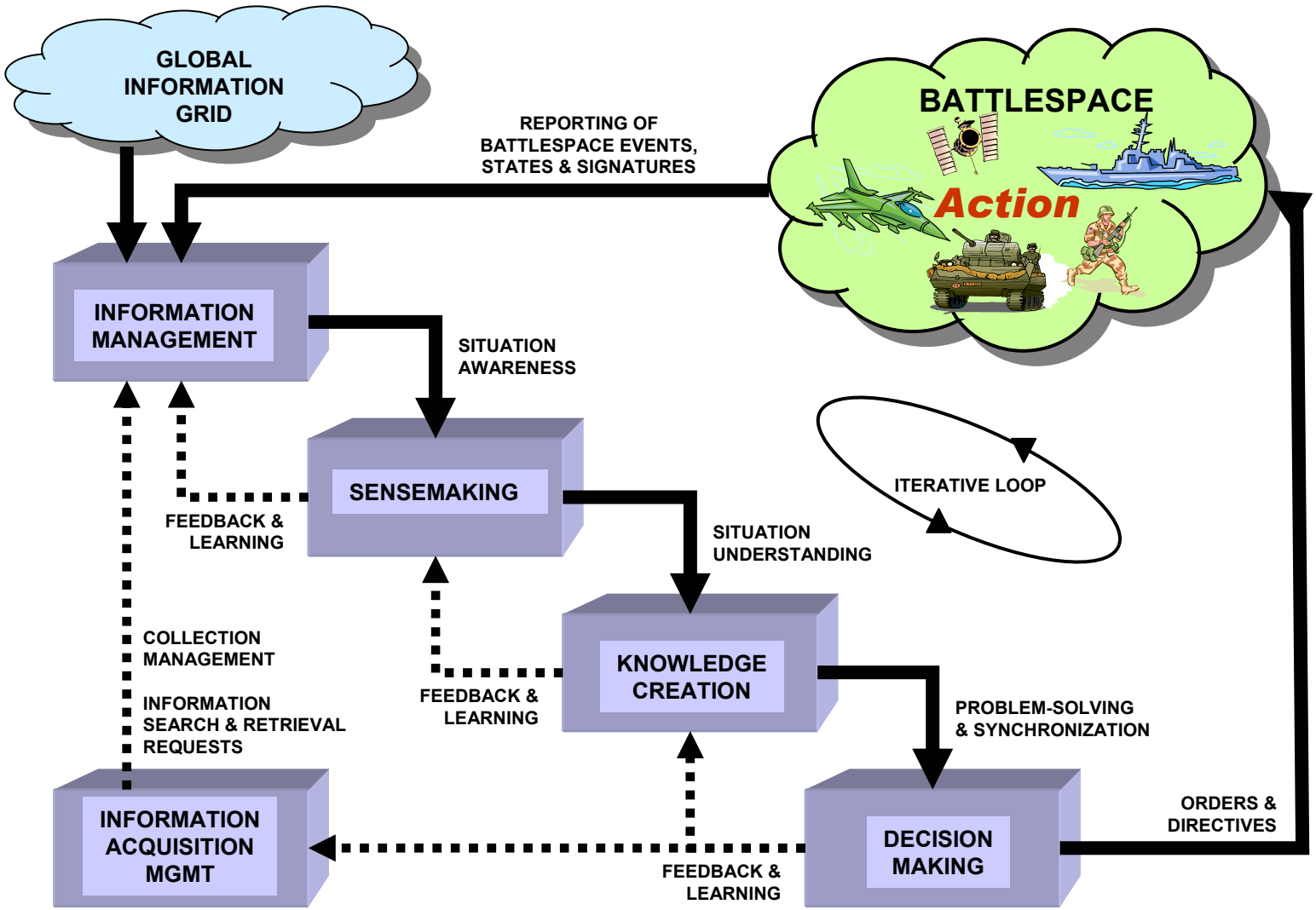
- **Current generation COP built on outdated "information warehousing" paradigm**
  - *Information poorly organized and validated*
  - *Information difficult to search*
  - *Much of the information is or marginal relevance to decision makers*
- **Military decision making has increased in complexity**
  - *Effects-based operations balance both lethal and non-lethal methods to defeat an adversary's will to fight while minimizing collateral damage to populations whose support we ultimately desire*
  - *Asymmetric warfare presents new dimensions of goal complexity –e.g., military defeat of an adversary versus management of public opinion*
  - *Coalition operations, combined with humanitarian/relief operations bring many new participants and stakeholders to the table*
- **Next Generation COP must help command organizations deal with:**
  - *Ambiguous operational problems and tasks*
  - *New types of emergent threats and opportunities*
  - *Broad set of stakeholders and perspectives*

Developing the Next Generation COP

- **Requires solid theoretical models of critical organizational processes:**
  - *Information Management*
  - *Sensemaking*
  - *Knowledge Creation*
  - *Decision Making*
- **These models should be informed by relevant, empirical research from the behavioral and social sciences**
- **The challenge is to transform these often ethereal bodies of research into**
  - *<u>Practical guidance</u> for focusing technology development*
  - *<u>Quantitative metrics</u> for assessing ROI in new technologies*

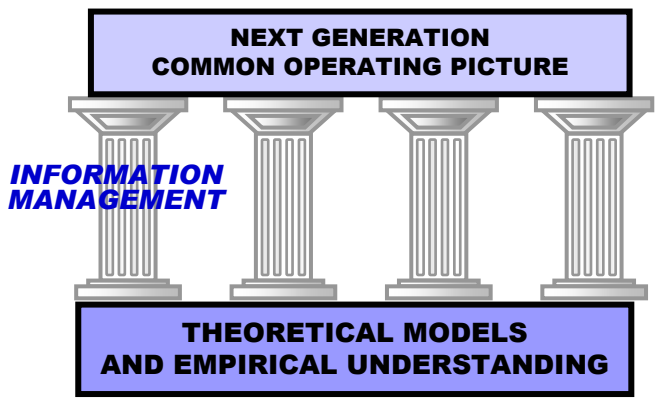


Organizational Model

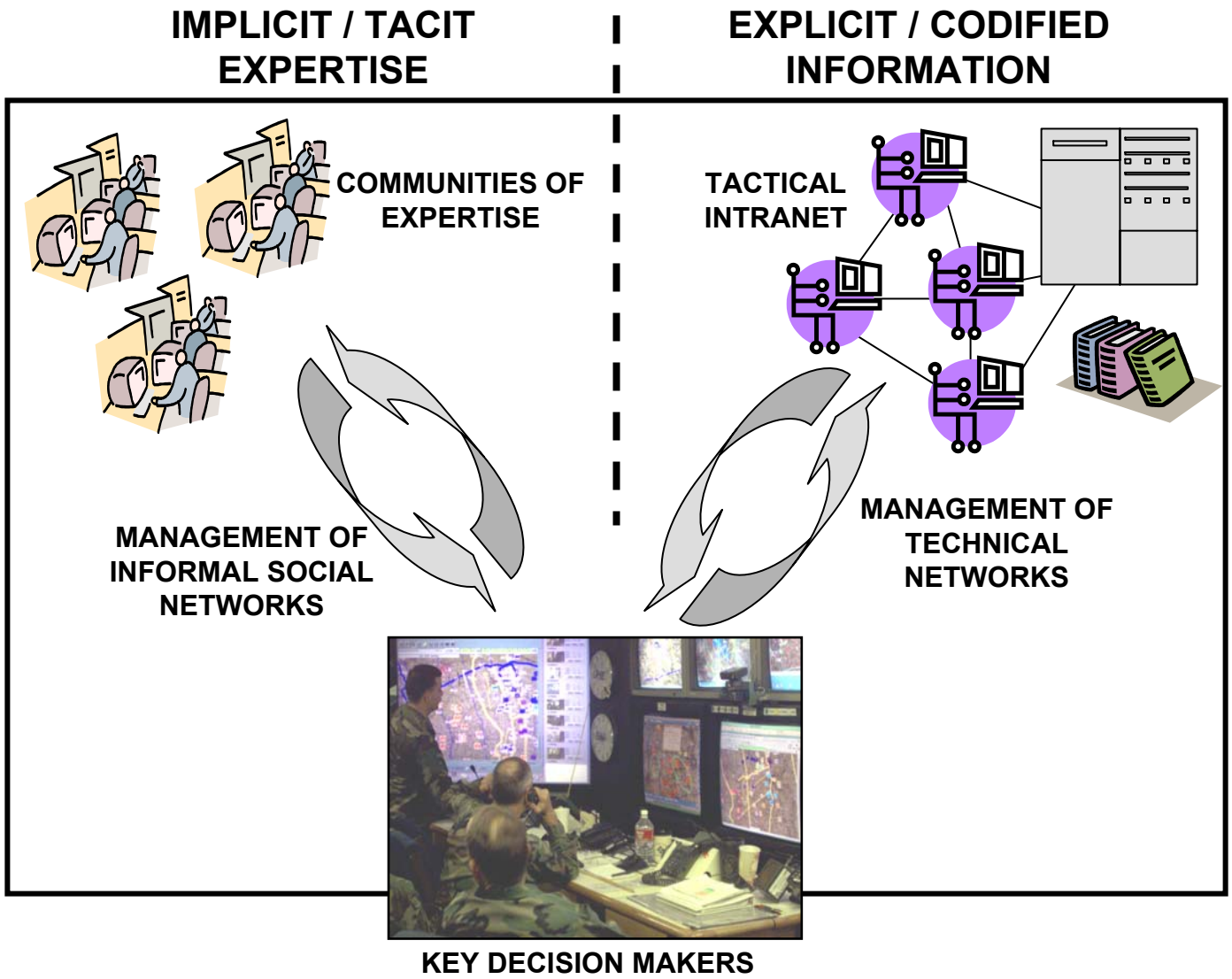


Information Management

- **Information management provides the foundation for the successive stages of the information transformation process**
- **Current implementations focus on technical issues of**
  - *Network connectivity / reliability*
  - *Network bandwidth*
  - *Information storage capacity*
  - *Information search / retrieval*
- **The next generation COP should assist command organizations in managing both the "know what" and the "know how"**
  - *"Know what" circulates with relative ease*
  - *"Know how" embedded within work practice and is often difficult to track, retrieve, and apply in moment-to-moment decision making*

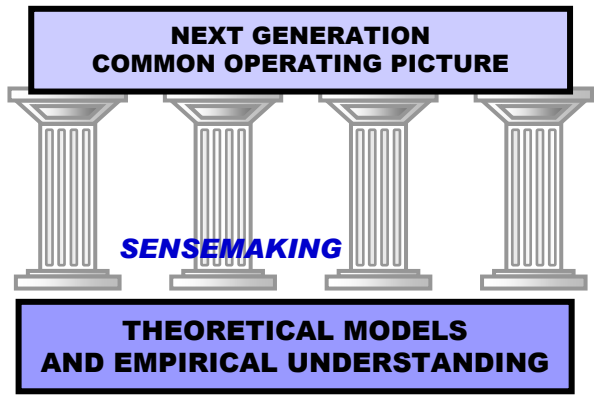


Information Management Challenges



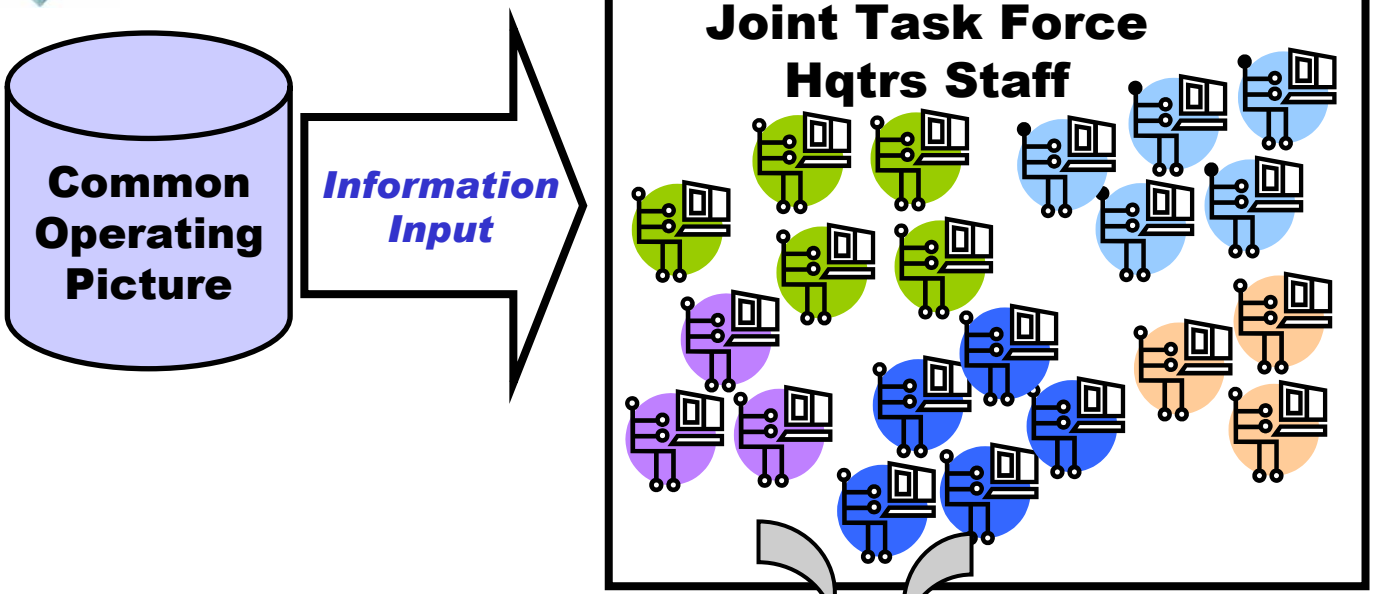
Sensemaking

- **Sensemaking refers to a number of sociocognitive activities undertaken by an organization when it is faced with novelty or operational situations that do not conform with prior expectations**
- **These expectations are based on a hierarchy of mental images developed from past experience and combined with on-going assessments of the battlespace**
  - *Participants and values*
  - *Goals and objectives*
  - *Course of action*
  - *Tactics*
  - *Critical events*
  - *Timing and flow*



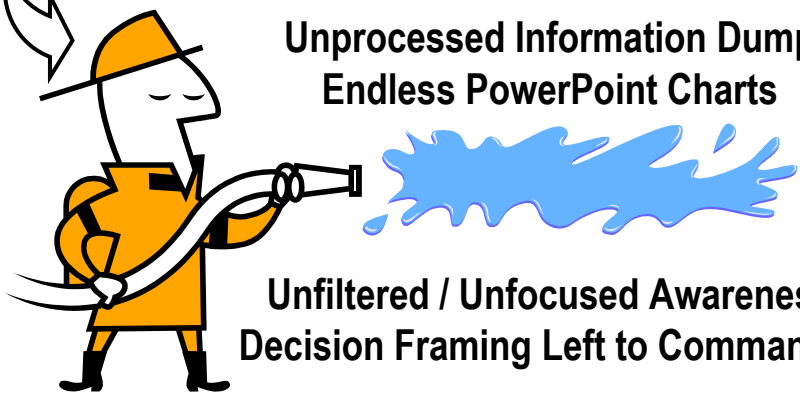
- **Battlespace conditions, change, adversary intentions and strategy are not always fully understood**
- **The fog and friction of war combine to produce novel situations and ambiguity**
- **Emergent threats and opportunities often reflect a mixture of military, political, and diplomatic issues**

Sensemaking Should Be Tailored



Shared Understanding
Identified Threats/Opportunities
Integrated Perspectives
Actionable Knowledge
Tailored Decision Frameworks

WHAT COMMANDERS WANT



Unprocessed Information Dump
Endless PowerPoint Charts

Unfiltered / Unfocused Awareness
Decision Framing Left to Commander

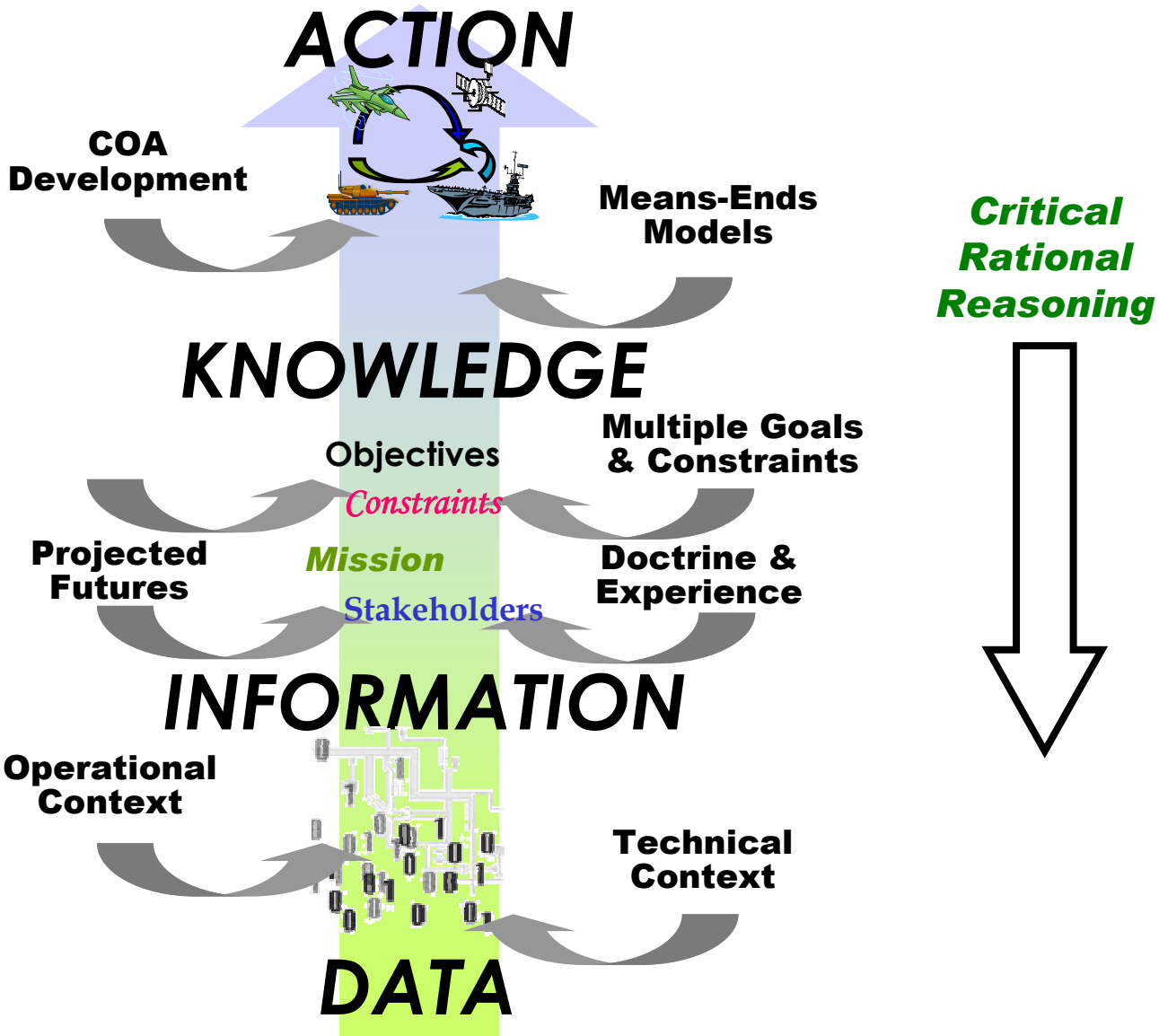
WHAT COMMANDERS OFTEN RECEIVE

Types of Organizational Ignorance

- **Situation Uncertainty**
  - *Lacking sufficient information or confidence in available information*
- **Information Glut**
  - *Being overwhelmed by too much information that prevents focusing on important elements of the situation*
- **Situation Ambiguity**
  - *Lacking an appropriate, experience-based problem framework for interpreting available information and associating responses*
- **Explanatory Equivocality**
  - *Having multiple, competing problem frameworks for interpreting available information*
- **Situation Emergence**
  - *Having an experience-based problem framework that yields only limited insight into an evolving or emergent situation*

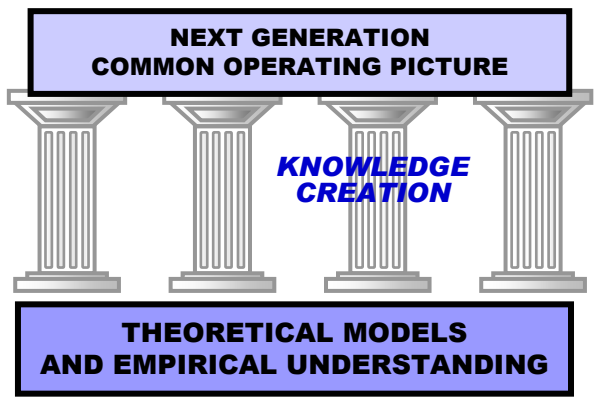
Each type of organizational ignorance requires a different management strategy !

Which Way Is Best?



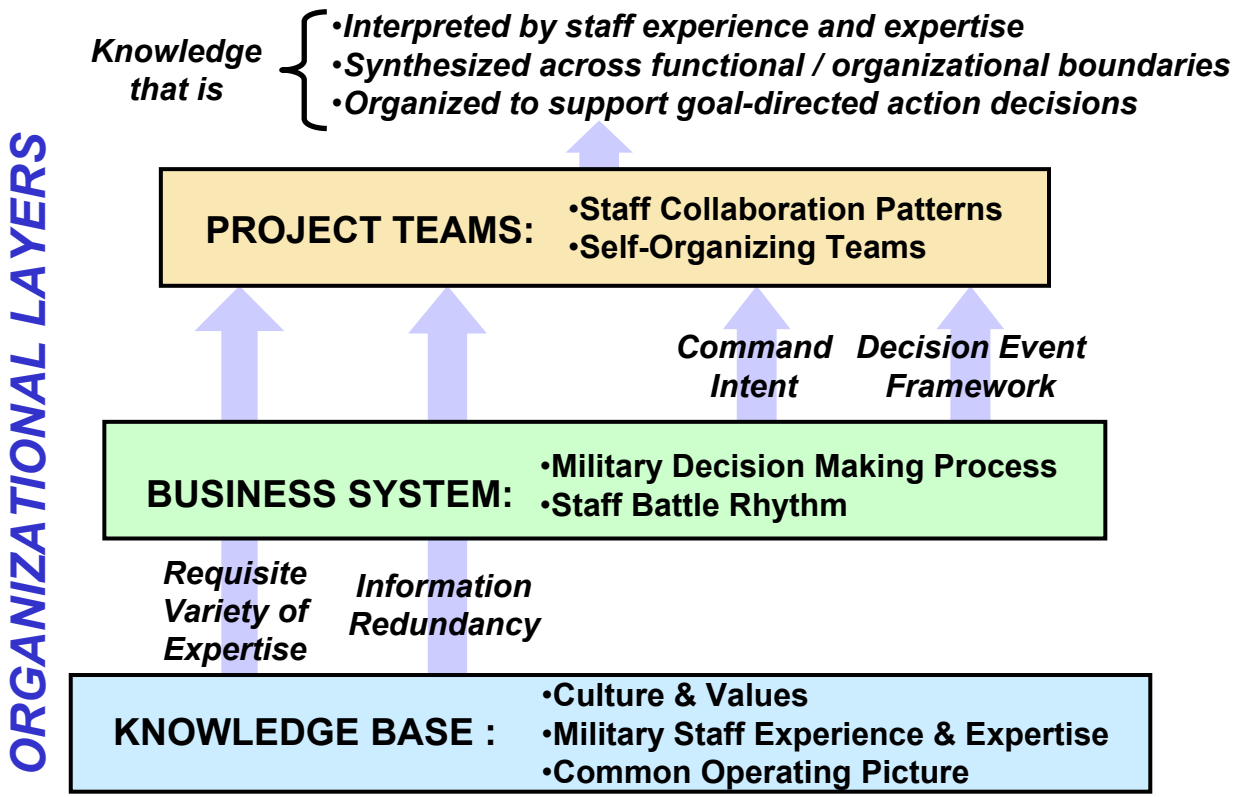
Knowledge Creation – Western Model

- **The western model of knowledge creation sees the organization as a marketplace that supports transactions among**
  - *Sellers (experts, knowledge bases)*
  - *Buyers (problem solvers, decision makers)*
  - *Brokers (gatekeepers, boundary spanners)*
- **Factors influencing the effective transfer and use of knowledge within an organization include**
  - *Trust*
  - *Culture / vocabulary / frames of reference*
  - *Time / resource limitations*
  - *Status / social capital*
  - *Absorptive capacity*
  - *Knowledge ownership*
  - *Intolerance for error*
- **Information "tagging" enables flexible and reliable use of knowledge by multiple users**
  - *Tags provide contextual information needed for proper interpretation of knowledge products*
  - *Tags reflect "knowledge pedigree"*

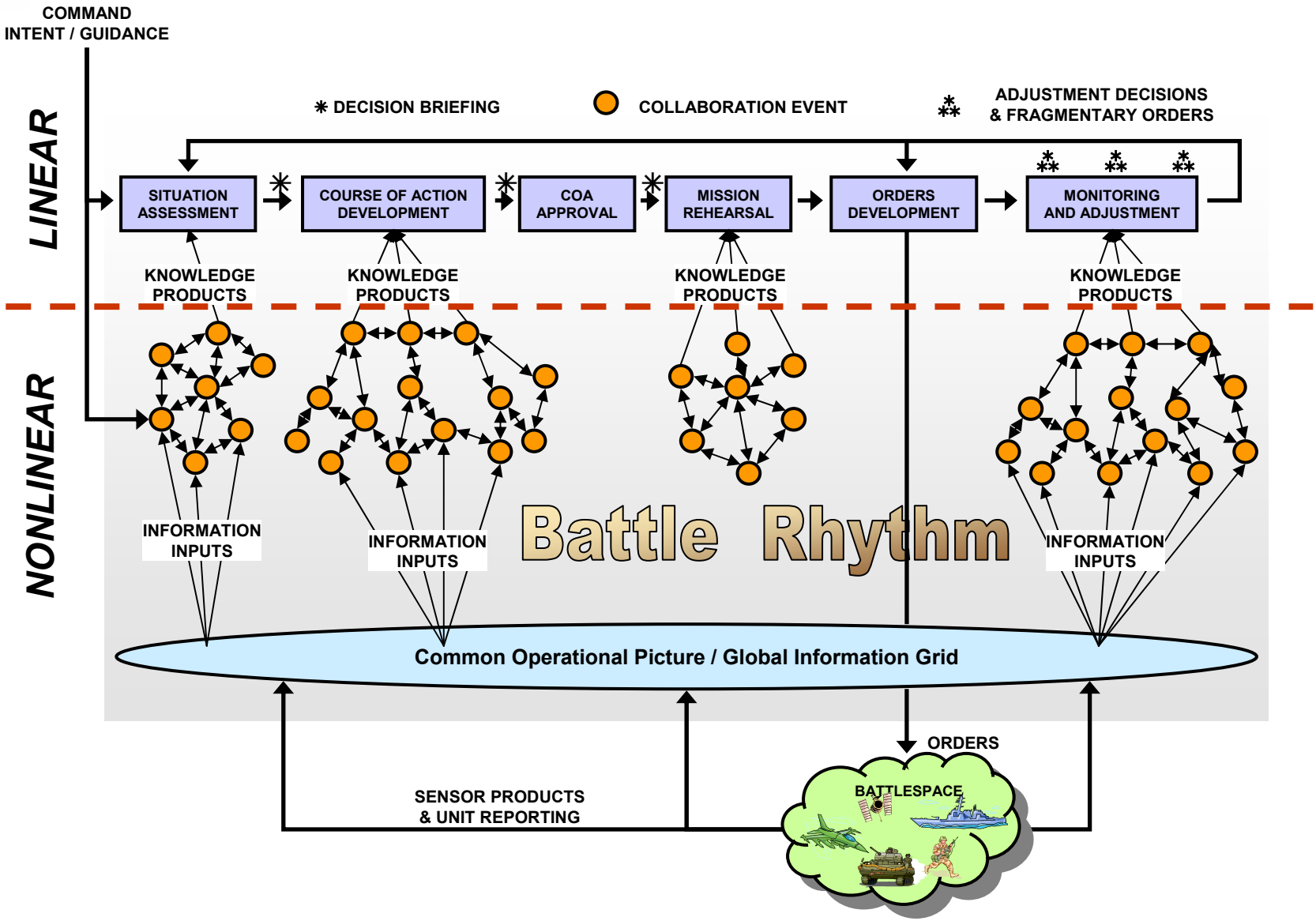


Knowledge Creation – Eastern Model

- **The eastern model of knowledge creation emphasizes the situational value of knowledge that has been organized and interpreted to meet the specific decision needs of the moment**
- **This model sees the organization as being comprised of three layers:**



Battle Rhythm

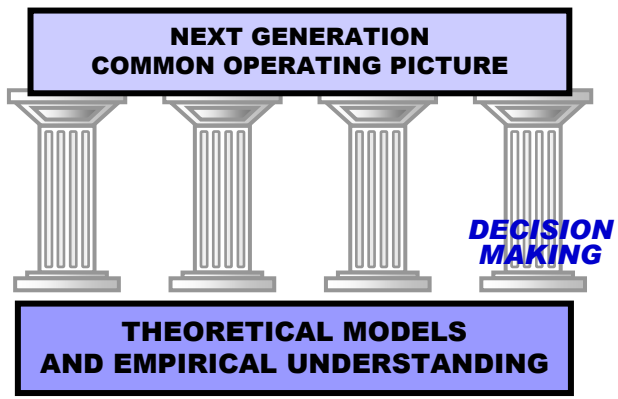


Collaboration Management

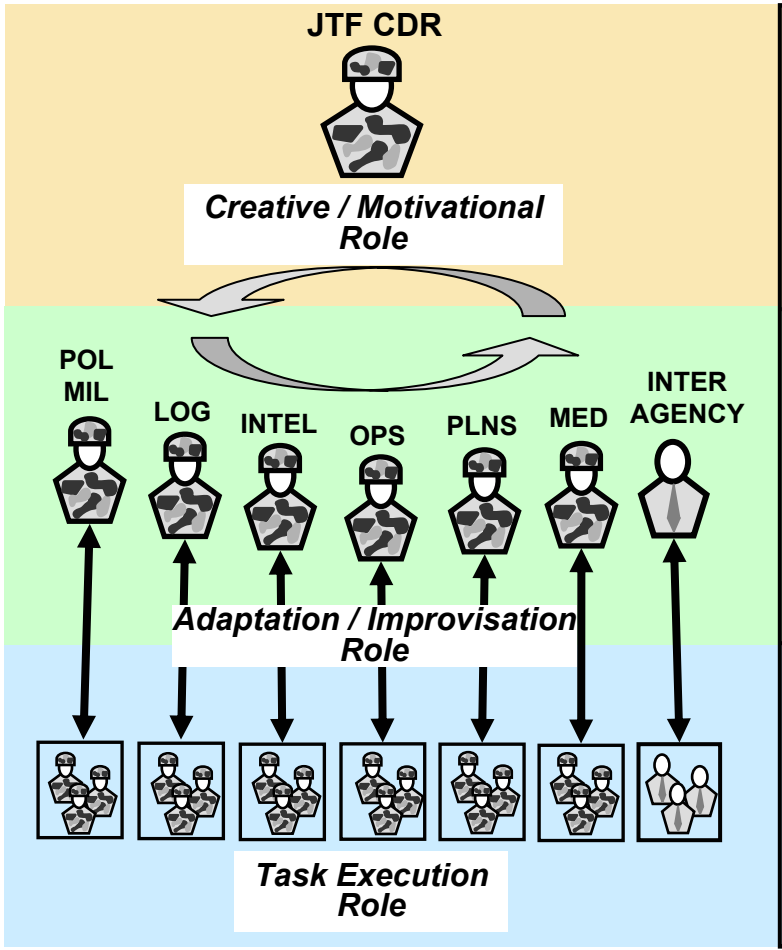
- **Current generation collaboration tools**
  - *Assist participants in developing a common framework of understanding for exchanging ideas and information and engaging in collaborative problem solving*
  - *They include e-mail, instant messaging, shared whiteboards, chat rooms, multimedia auditoriums, and shared workspaces*
- **However, the current generation of tools do not address the fundamental sociocognitive issue: when is it appropriate and necessary for specific sets of experts to engage in collaboration?**
- **Collaboration management is needed to tailor an efficient organizational response to each class of operational problem**
  - *Simple Problems* → *Centralized authority directs implementation of agreed solution; collaboration is unnecessary*
  - *Complex Problems* → *Central authority adjudicates competing proposals from different stakeholders; collaboration is limited*
  - *Wicked Problems* → *Collaboration among experts and stakeholders is essential for developing an organizational response*

Decision Making

- **While decision making cannot be separated from the activities of sensemaking and knowledge creation, research in this area provides insight into two additional issues:**
  - ***Different decision making responsibility exist at each level within a command organization***
  - ***Different decision making modes are employed as a function of situation ambiguity and time stress***

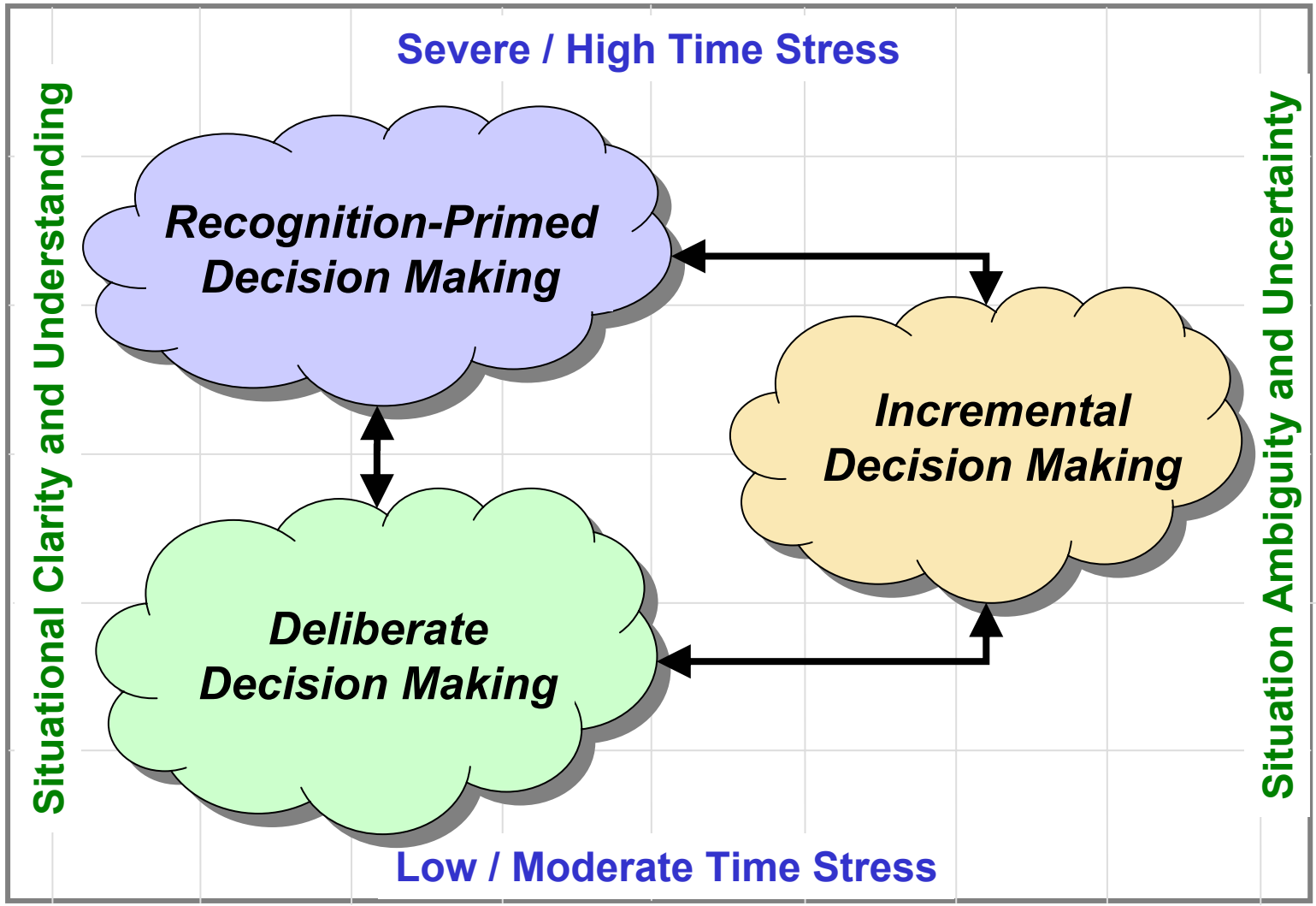


Decision Making Responsibilities



COMMAND	• Create vision and set goals to shape ill-defined problem space • Focus and motivate the staff • Scan for decision opportunities • Adjudicate conflicting perspectives • Approve courses of action and operational adjustments
PRINCIPAL ADVISORS	• Monitor functional areas to identify emerging threats / opportunities • Develop common understanding • Assist commander with shaping of decision opportunities • Adjust / improvise / synchronize plans in each functional area
SUPPORT STAFF	• Build COP within specific areas of responsibility • Track operations / conduct specific analyses as directed by advisors • Develop detailed courses of action • Build / transmit plans, orders, and directives for subordinate units

Modes of Decision Making



Key Technology Areas

- **Flexible Knowledge Codification and Management**
  - Knowledge mapping language that supports flexible meaning and application
  - Management systems for tracking acquisition and status of newly generated knowledge
  - Systems for tracking key variables, events, and situations that alert staff to overlapping stakeholder interests
  - Templated knowledge structures for communicating narrative experiences
  - Personnel tracking systems for maintaining awareness of available expertise
- **Collaborative Sensemaking**
  - Systems that allow depiction and mapping of held beliefs / assumptions onto the COP
  - Visualization technologies for characterizing different forms of situational ignorance in each part of the COP
  - Wargaming methods that allow projected futures to be viewed from multiple perspectives
  - Methods for continuously comparing projections against a framework of held expectations
  - Information display architectures that facilitate rapid incorporation of new problem dimensions and key variables
- **Multi-Perspective Knowledge Creation**
  - Architectures for brokering available information against the specific needs of different consumers
  - Dynamic “information tagging” that provides users with situationally-relevant context for interpretation
  - Architectures that enable dynamic creation of as hoc “project teams” or communities of interest
  - Methods that facilitate the filtering, interpretation, and organization of information into actionable knowledge
- **Multi-Level Decision Making**
  - Information architectures that support multiple levels of decision making tasks within a command organization
  - Information management tools that support the structuring, articulation, and correlation of information in support rapid transition among different decision making modes

Summary

- Current COP designs reflect an inductive reasoning process that works reasonably well for tactical (engagement) decision making
- Future COP designs must solve a different problem: *how to dynamically collect and situationally organize information in a way that is relevant to the commander's decision process*
- Hence, future COP designs will be "concept-driven" as much as they are "data-driven"
- Future COP designs must account for the increased complexity of military operations and the presence of multiple stakeholders
- Hence, the functionality of the information technology supporting the COP must account for critical cognitive and social factors that govern the operation of a military headquarters