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Computer-based Critiquing Systems : Cognitive Support Tools for the Estimate Process

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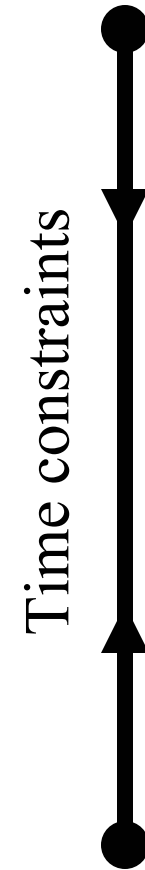
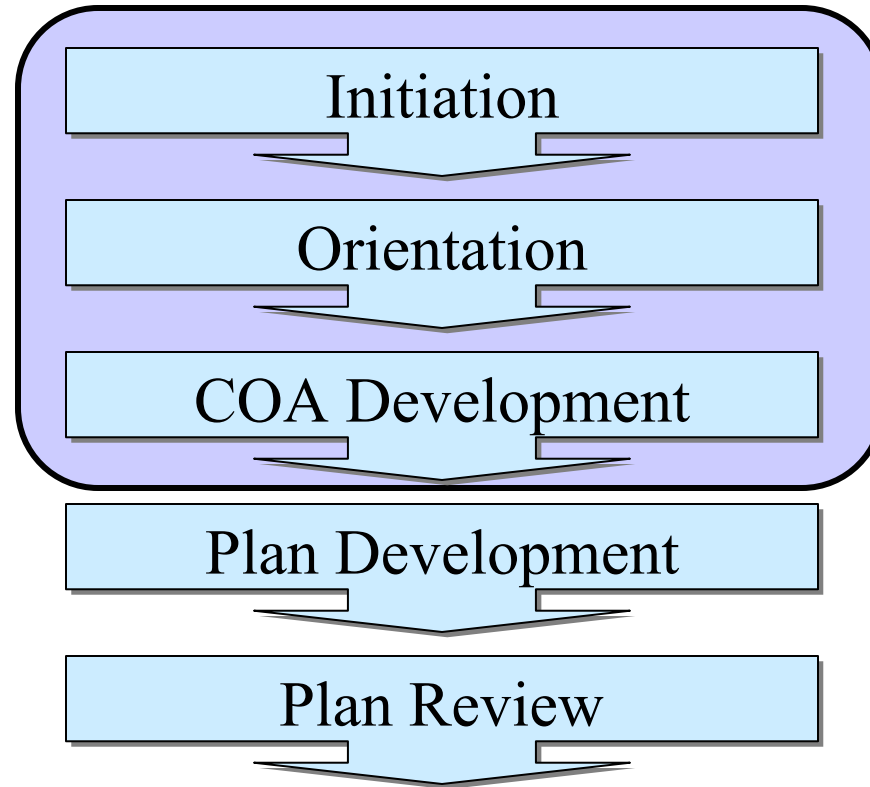
Agenda

- CFOPP
- Critiquing systems
- Aspects to consider in the Estimate Process
- Types of critiquing systems for the Estimate Process
- Cognitive support systems
- Conclusion



CFOPP

**Estimate
Process**

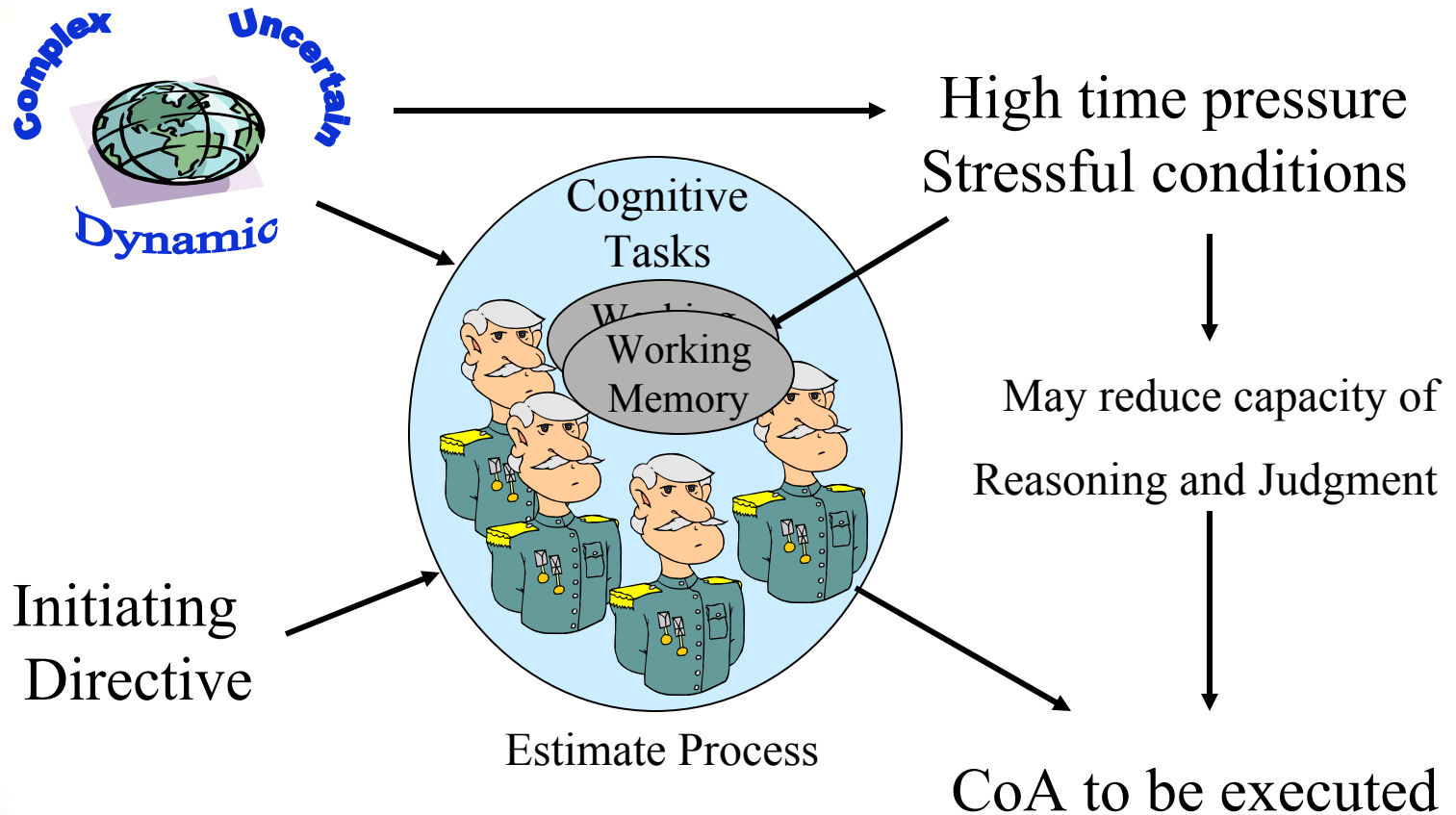


Operational Level

Deliberate Planning



Estimate Process

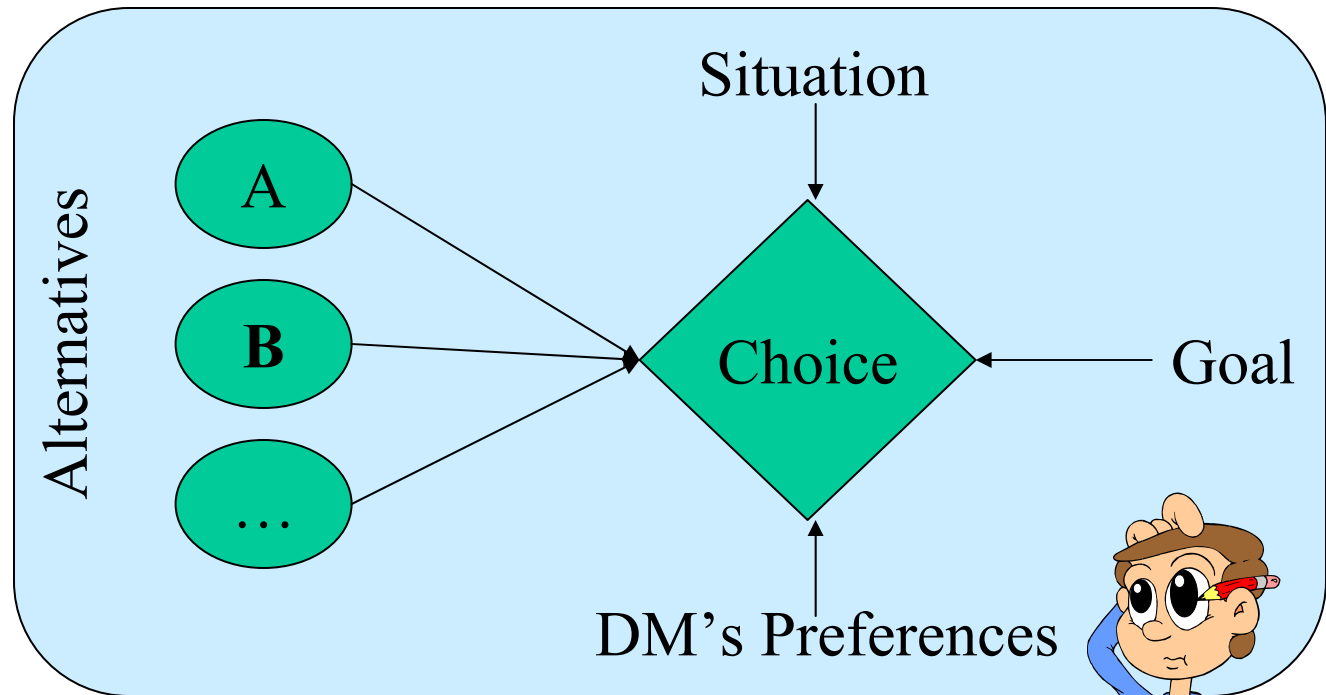




Approaches to improve the EP

- Supporting the creation (conception) of the different decision elements

Decision Elements



- Increasing the role of critical thinking

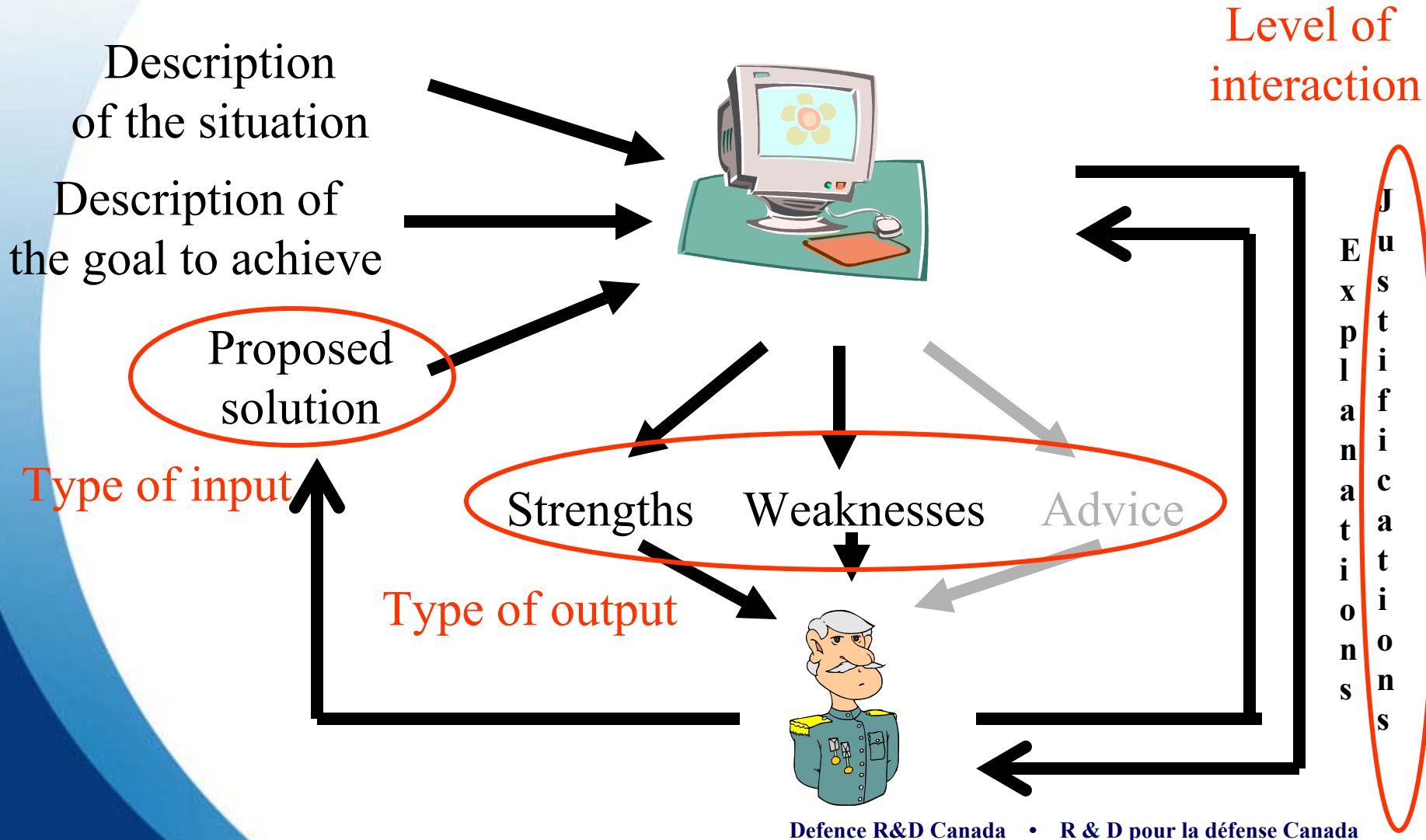


Critical Thinking

- “**The ability to analyze, criticize, and advocate ideas**; to reason inductively and deductively; and to reach factual or judgemental conclusions based on sound inferences drawn from unambiguous statements of knowledge or belief.” [Freeley and Steinberg 2000]
- Motivates one to **look for evidence** that could potentially **contradict** what one believes in one’s mental model of the problem. [Bryant 2003]
 - Enhanced decision making



Computer-based Critiquing Systems



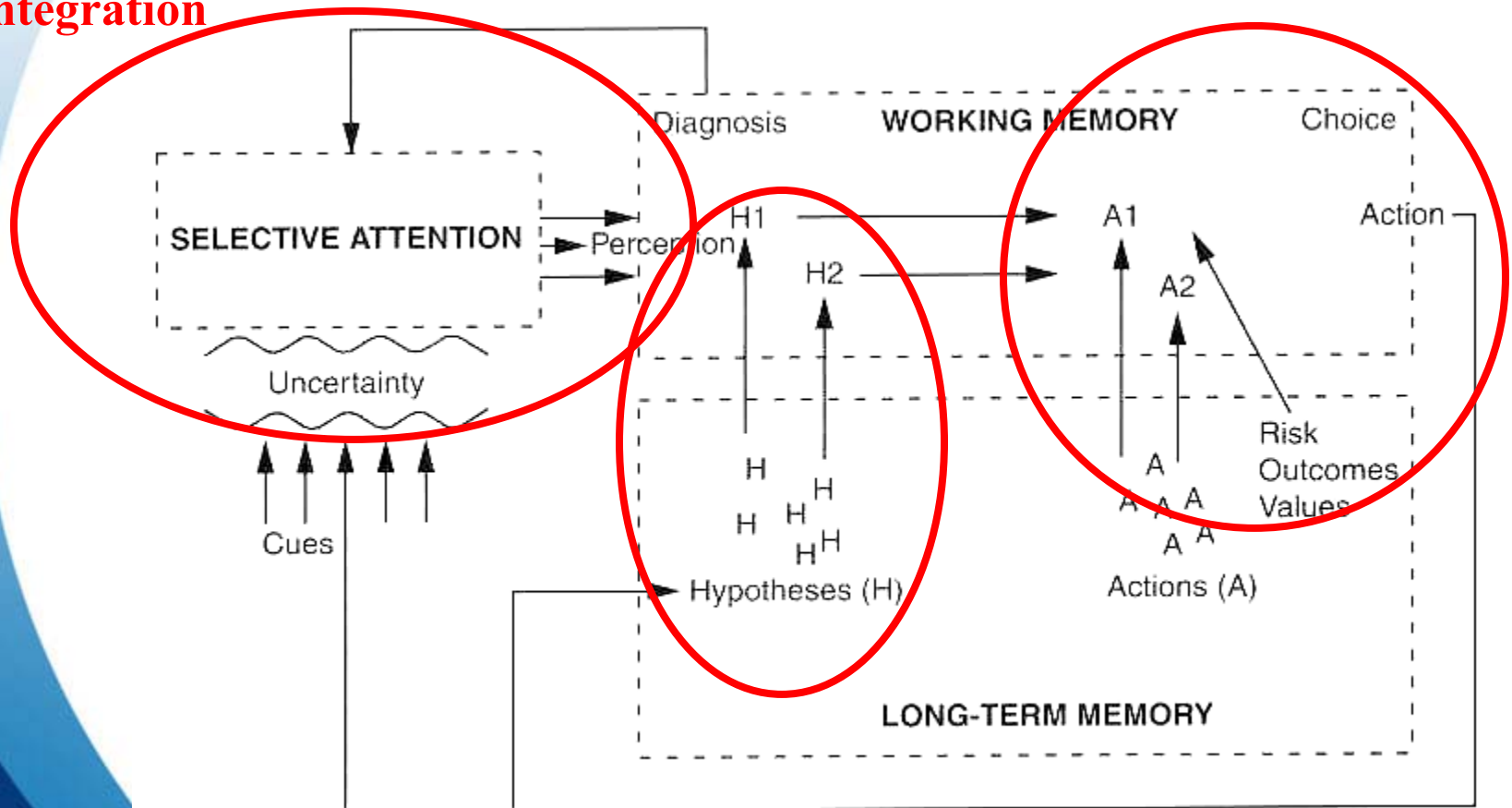


Information Processing Limits in Decision Making

Hypothesis generation,
evaluation and selection

Plan generation and
action choice

Cue reception
and integration



© Wickens & al. 2004

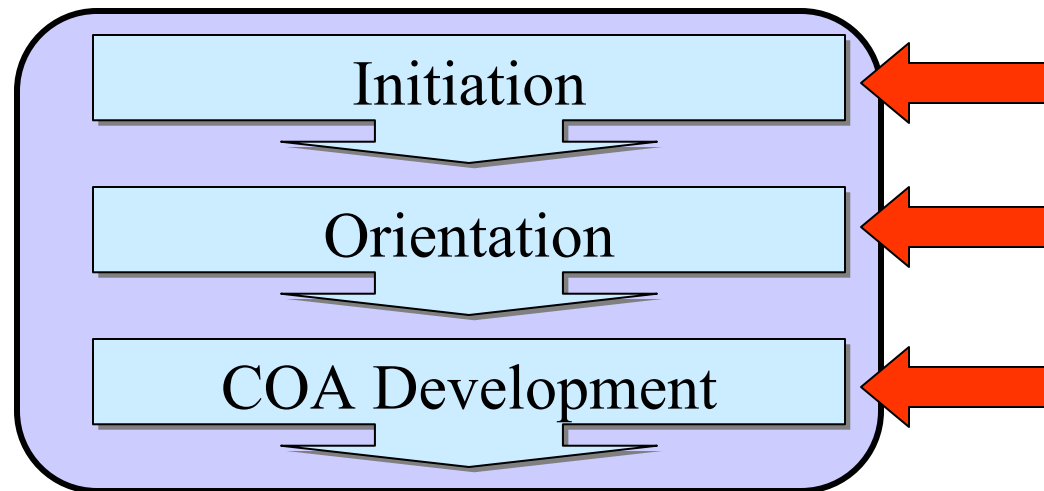
Feedback



Cognitive support tools for the Estimate Process?

Which critiques could help in counteracting biases in:

Estimate Process

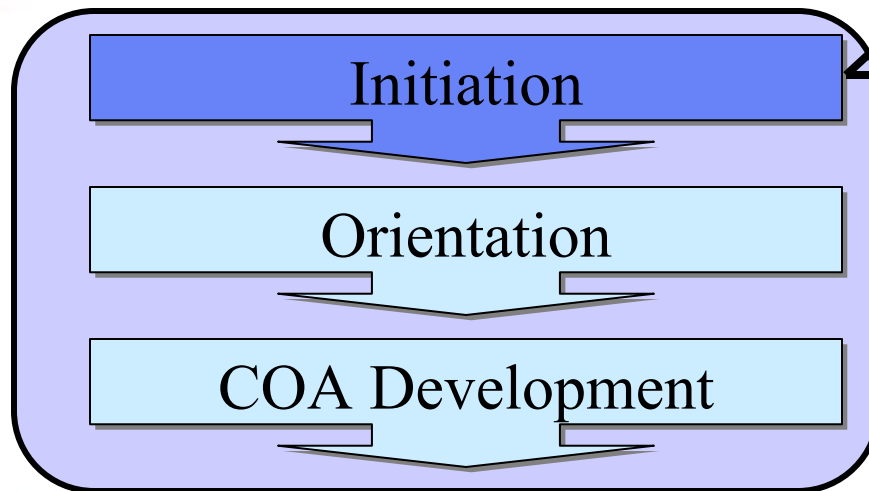


What are the aspects that could benefit of being challenged?



Initiation Stage

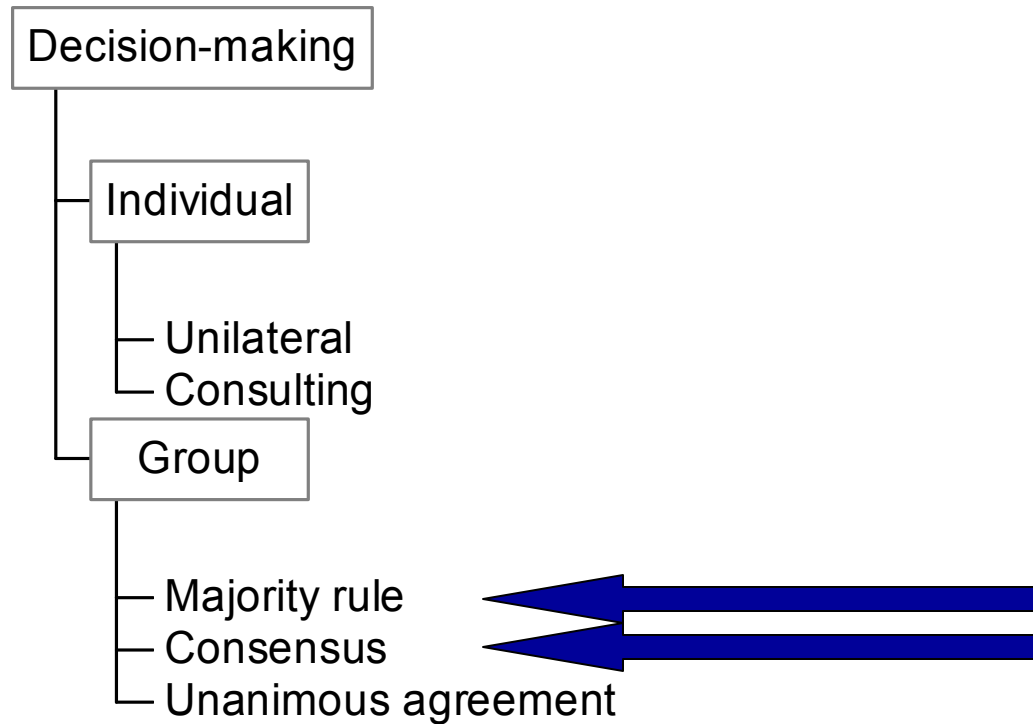
Estimate Process



- The planning staff
- The decision-making strategy



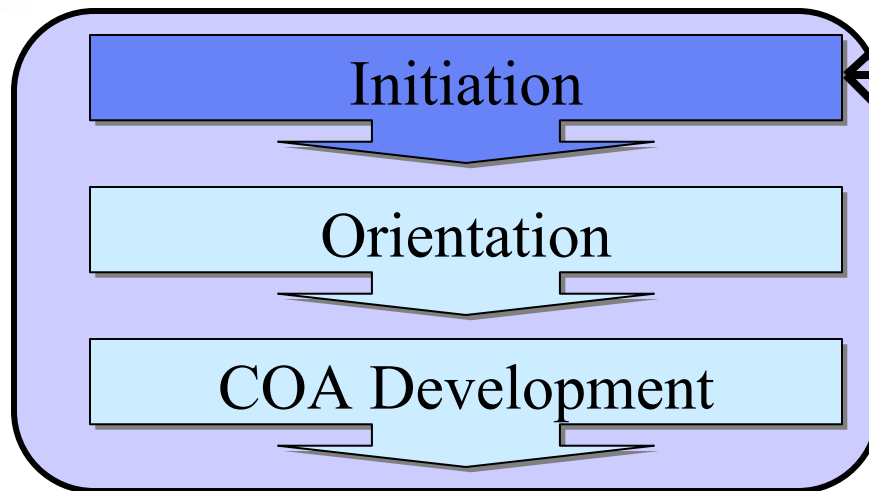
The Decision-making strategy





Initiation Stage

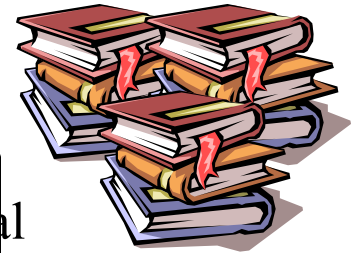
Estimate Process



- The planning staff
- The decision-making strategy
- The tools used



The tools used

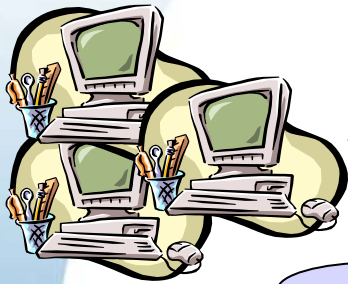


Theoretical Cases

Lessons not Learned

Lessons Learned

Geomatic Knowledge



Expert Knowledge

Doctrine

Past Cases Experiences

Cultural Knowledge



Do we have access to all pertinent sources of knowledge available?

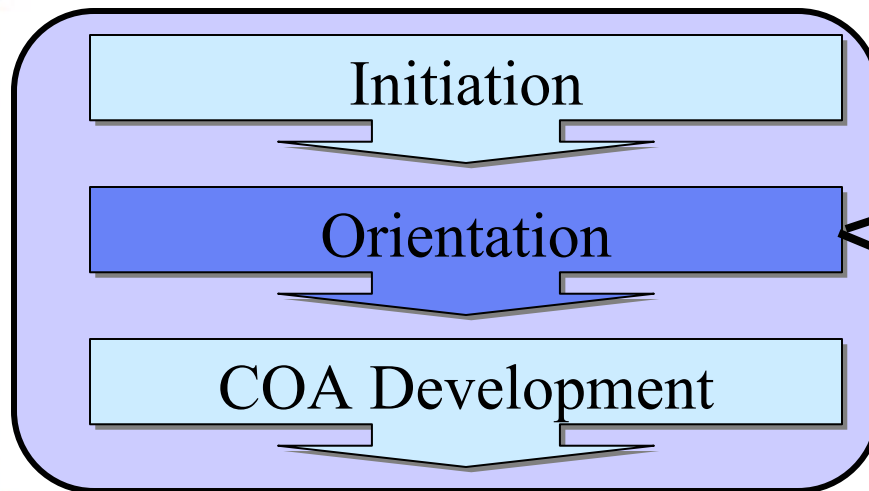
Any conflicting evidences?

What is the credibility of these information?



Orientation Stage

Estimate Process

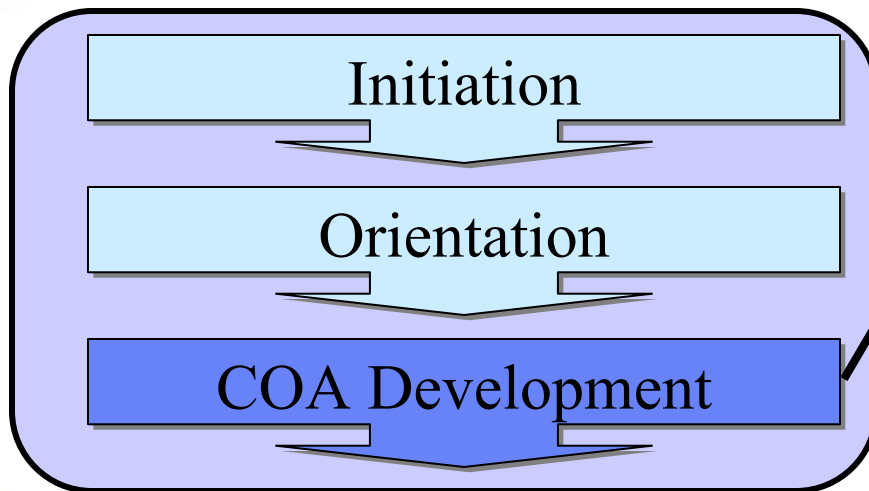


- Analysis of the situation
- Mission Statement



COA Development Stage

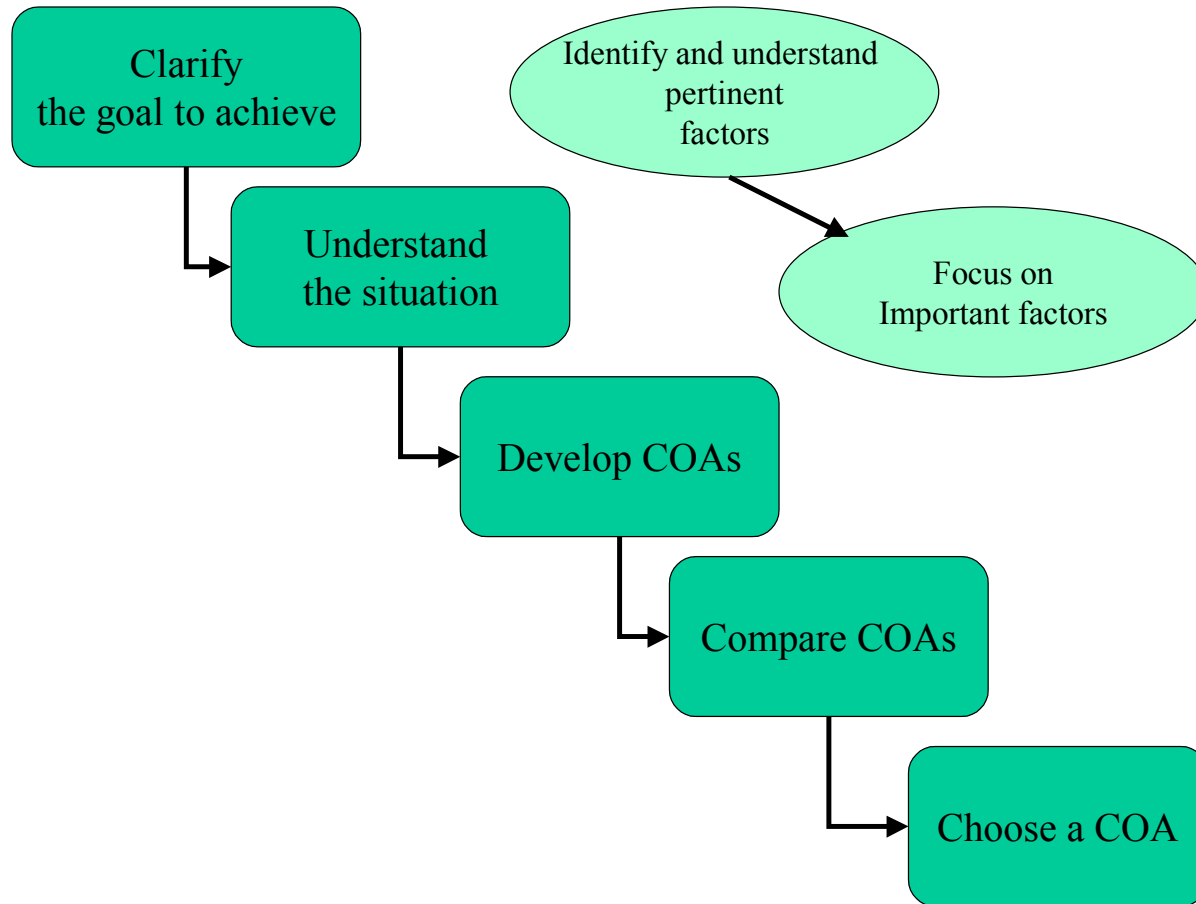
Estimate Process



- COA Development Process



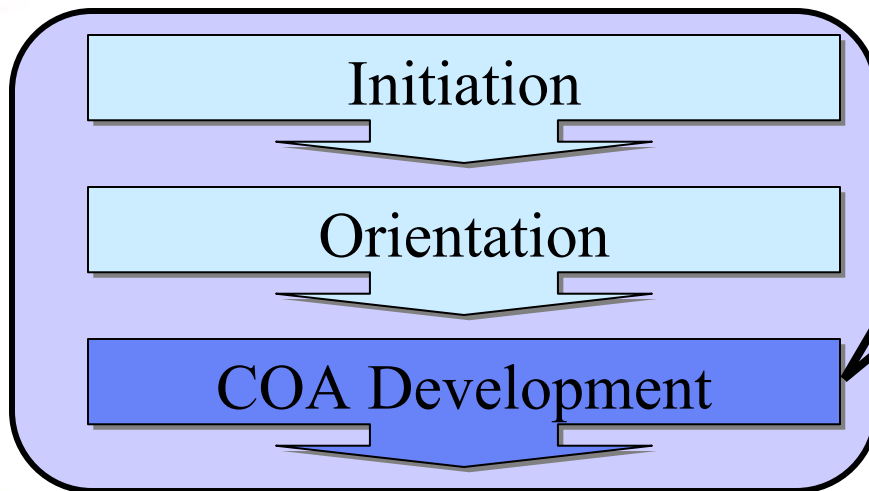
COA Development process





COA Development Stage

Estimate Process



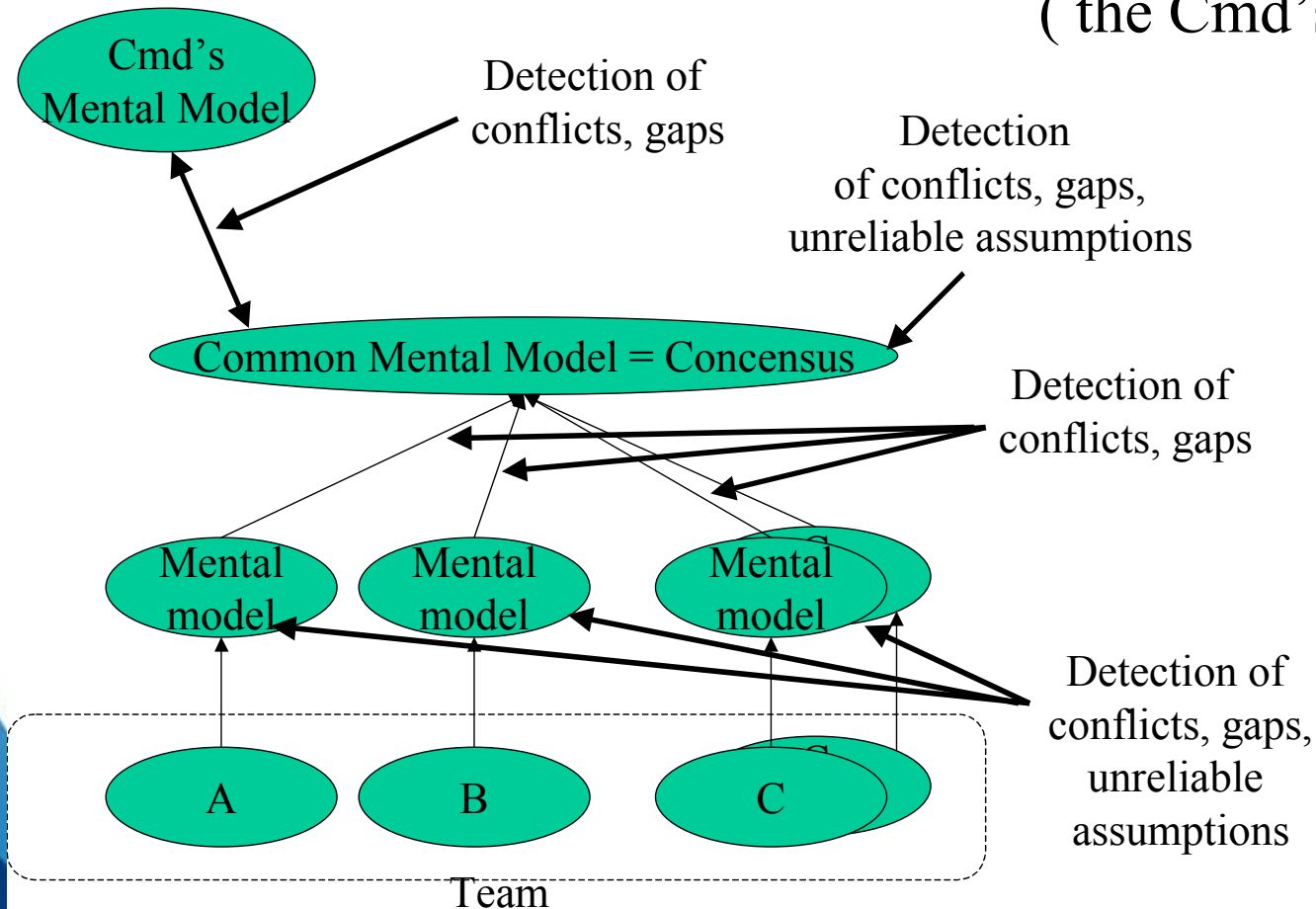
- COA Development Process
- Understanding of the goal to be achieved



Understanding of the goal to be achieved

– A share understanding of the goal

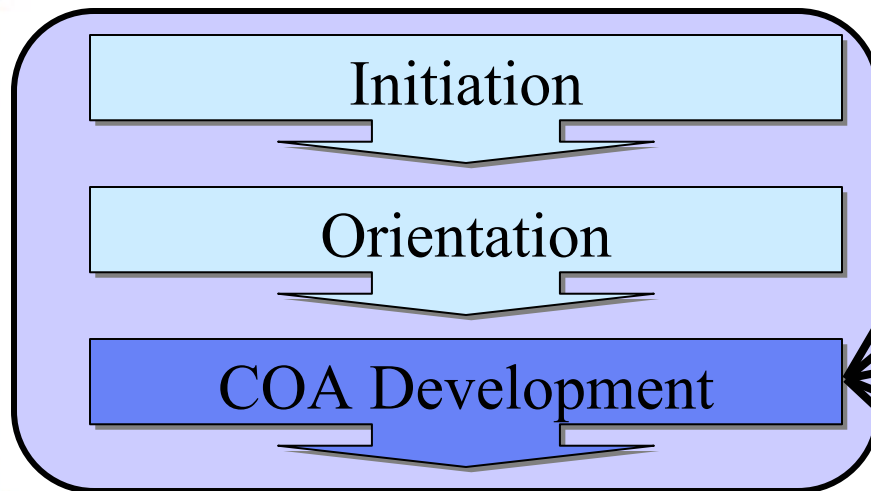
(the Cmd's Intent)





COA Development Stage

Estimate Process



- COA Development Process
- Understanding of the goal to be achieved
- Staff analysis
- Enemy COAs
- Friendly COAs



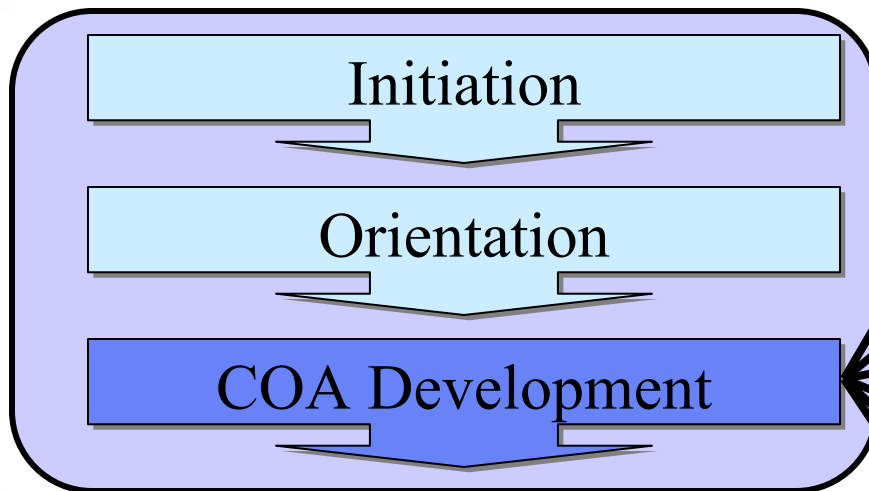
Friendly COAs

- Detection of conception problems
- Viability
- Enemy COAs
- Direct as well as indirect effects
- Exhaustiveness of the COA list



COA Development Stage

Estimate Process



- COA Development Process
- Understanding of the goal to be achieved
- Staff analysis
- Enemy COAs
- Friendly COAs
- Comparison of COAs



Comparison of COAs

Decision Grid	COA1	COA2	COA3
Aspect1 (weight1)	rate1 1	rate1 2	rate1 3
Aspect2 (weight2)	rate2 1	rate2 2	rate2 3
Aspect3 (weight3)	rate3 1	rate3 2	rate3 3
Global rank	COA1rank	COA2rank	COA3rank



Three different categories of critiquing systems

- The different products that are produced during the Estimate
 - Ex. The planning staff, the planning tools, the situation analysis, the mission statement, the staff analysis, the enemy courses of action, the friendly courses of action, the comparison of friendly courses of action
- The different processes to be executed in order to go through the Estimate Process
 - Ex. the decision-making strategy, the COA development process
- The team's mental models perceived
 - Ex. the team's understanding of the goal to achieve, the team's understanding of the situation, the team's assessment of the COAs



Critiquing systems as cognitive support tools

- Critiquing systems for these products:
 - The situation analysis
 - The staff analysis
 - The ECOAs
 - The FCOAs
 - The comparison of FCOAs
- May counteract biases associated with
 - Receiving and using cues
 - Hypothesis generation, evaluation and selection



Critiquing systems as cognitive support tools

- Critiquing systems for the different processes
 - The COA development process
 - May counteract biases in action selection
- Critiquing systems for the monitoring of mental models
 - Do not directly counteract biases



Conclusion

- From
 - Aspects to be questioned during the Estimate Process
 - Biases that result from limited cognitive resources
- We have identified
 - Critiquing systems that could be considered cognitive support tools
- Designing cognitive support systems require to have knowledge about:
 - The type of biases that need to be countered
 - The process in which the systems will be in

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