Large-Scale Collaboration for Ill-Structured Problems

Drs. John Kruse, Joel Helquist, Mark Adkins
Outline

- Background
- Network-centric operations
- Control spectrum
- Collaborative bottlenecks
- New group support system model
Background

- Success on battlefield:
  - More dependent on broad, integrated efforts
  - Sense-making in a complex, dynamic environment

- Collaborative tools available:
  - Generally analogous extensions of manual collaboration
  - Susceptible to scalability issues
Network-centric Operations (NCO)

- High quality and timely information
- People act independently and interdependently
- Decentralized approach that can produce efficiencies over a hierarchical, centralized organization

NCO Benefits

- Self-synchronization:
  - Commander’s intent + rules of engagement + plans/orders + superior local knowledge
- Agility
  - Command can rapidly adapt to meet contingencies
Command & Control Spectrum

Industrial Age approach with Lean communication channels

Variety of sensors and complicated communication channels

C2 Approach Spectrum

Cyclic

A central command issues detailed orders on a regular schedule.

Interventionalist

A central command issues detailed orders with opportunities to alter the plan as opportunities or threats emerge.

Problem-Solving

The higher command issues detailed intervening objectives and milestones to be accomplished.

Problem-Bounding

The higher command issues objectives with specific constraints or directives.

Selective Control

The higher command issues objectives and intervenes selectively in subordinate operations.

Control Free

The higher command issues objectives for subordinates to achieve.

- Alberts and Hayes, 2003
Collaborative Bottlenecks

- Current collaborative processes are limited
  1. Facilitator bottleneck - Cost, availability, quality & cognitive bandwidth
  2. Serial workflow - Many collaborative processes do not allow parallel participation

- These drawbacks cause process bottlenecks that further limit
  - Synchronicity
  - Proximity
  - Flexibility
  - Scalability
Collaboration Level

- Chat
- VTC
- Application Sharing
- Whiteboard
- GSS

More Difficult

Participants

Many

Few

Collaboration Level

Individual

Coordination

Group Dynamics
Patterns of Collaboration

- 6 patterns of collaboration
  - Generate
  - Reduce
  - Clarify
  - Organize
  - Evaluate
  - Build consensus

- Significant literature regarding generate (brainstorming)

- Dearth of research regarding other activities
Collaboration Workflow
Convergence Bottleneck

- Difficult to do in a group setting
  - Must balance multiple ideas and opinions

- Often requires the use of an expert facilitator
  - Discuss themes and guide group

- Work becomes serial in nature and less collaborative
  - Lose anonymity

- Constraints on synchronicity and proximity
Participant-driven Collaboration

- Decompose convergence into discrete roles (modules)

- Each role is independent but required to move the group toward collaboration

- Participants iterate through various roles
  - Parallel
  - Autonomous
Participant-driven Collaboration

System assigns participants to roles where they are currently needed

Participants move from role to role

Brainstorming Input

Correct Input

Cluster into Threads

Combine/Separate Threads

Summarize Threads

Combine Redundancies

Evaluate Input

Name Threads

Synthesized Threads
Discussion
Project Goals

What are we trying to do?

- Develop a browser-based, open source Group Support System (GSS)
  - Aid practitioners and researchers
  - Support a full range of collaboration
    - Traditional GSS, thinkLets, PD-GSS, etc.
- Modify current GSS workflows to create more dynamic, agile collaborative processes
  - Participant-driven GSS (PD-GSS)
Project Roadmap

What is new with our approach?

- First – Build light, free and robust collaboration system
- Second - Speed collaborative processes by replacing cumbersome, serial processes with full parallel participation
- Third - Lessen, and in some cases remove, the requirement for the slow and expensive human facilitator
- Fourth - Significantly increase agility by easing development of new activities
The Long Tail

- Much of our expertise is untapped
  - Commitment – I can give 15 minutes, not 2 hours
  - Inconvenience – Distributed and asynchronous

- The network allows us to engage a greater number of participants

- The Long Tail - Derive value from the *marginal contribution of the least interested participant* – Clay Shirky

- Examples
  - “Crowd sourcing”
  - Wikipedia
  - Slashdot, Digg
Collaboration Participation

Typically, as collaboration grows more complex, participation decreases.
A major goal of Koncero is to increase participation, especially active participation.
Roles

- Evaluate input
  - Provide rating of brainstorming ideas

- Correct input
  - Improve completeness & coherence of ideas

- Combine redundancies
  - Consolidate ideas
Roles (cont)

- Cluster ideas into threads
  - Identify threads or themes

- Name and rename threads
  - Develop label for threads

- Summarize threads
  - Develop concise textual summarization