Organizational Structure and Dynamic Information Awareness In Command Teams

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The Command & Control Research & Technology Symposium
SPAWAR, San Diego, CA
June 15 - 17, 2004

*Sponsored by the Office Of Naval Research,
Contract No. N00014-99-C-0255, COTR Gerald Malecki
FORCEnet Principles Hold Promise

- Modeling & simulation effort conducted for SSG-XXI, predict:
  - An increase in shared knowledge in a FORCEnet structure
  - Allow organizations to respond more effectively to new & unexpected situations
    - More adaptable structures
    - Will handle complex tasks that require coordination more effectively than current organization structures
  - In FORCEnet collaboration as a way of life
FORCEnet Drives Investigation of New C² Structures

- Modeling examined several structural changes
  - One example - creations of an intelligence, surveillance, and reconnaissance (ISR) coordinator
  - Could increase mission performance by as much as 25%

- A primary goal of this research was to empirically test this model prediction
  - ISR vs. no ISR organizational structures
Network Centric Warfare Spawns High Information Loads

- Increased volume of information that commanders must deal with
  - High information load can denigrate situation assessment & decrease mission performance
- Second study goal: investigate effects of high information load on decision making & mission performance
  - Manipulate information load across the two organizational structures (ISR & no ISR)
  - Embedded tactical judgment task to focus on critical aspects of decision making under different information loads
Tactical Judgment Task

- Addresses the process of **sequential revision of belief**
  - Task: estimate probability that the enemy would launch a counter-attack
  - Information necessary for the judgment task embedded in information flow
    - Two orders of information: 3 confirming followed by 3 disconfirming & 3 disconfirming followed by 3 confirming messages
    - Likelihood of attack assessed at middle & end of scenario

- A **contrast-inertia model** (Hogath & Einhorn, 1992) postulated to describe sequential revision process
  - The “order effect” – a heuristic error
  - Sequential order of confirming or disconfirming evidence can have a profound effect on participants’ judgments

- Not sure how information load will interact with order effect – two speculations
Experimental Design

- **Independent variables:**
  - **Organizational Structures (both functional)**
    - ISR Coordinator vs. No ISR coordinator (Surface Warfare Commander)
  - **Information Load**
    - High (9 messages per minute)
    - Low (3.5 messages per minute)
    - Counter-balanced across trials
  - **Confirmation order**
    - Confirm-disconfirm
    - Disconfirm-confirm
    - Between Ss - Nested

- **Primary performance measure**
  - Percentage of task attacked with 100% accuracy
Simulation Environment

DDD simulation: modified A2C2 Exp 8 Scenarios

- Scenarios used involved land, sea, & air operations to prepare battle space for insertion of follow on forces
- Primary mission was to engage in information gathering, achieve & maintain good SA, discern if enemy planned launch a counter-attack – monitor Email/Intel traffic
- Secondary task: complete mission tasks
Presence of an ISR Coordinator: Performance Results

Contrary to expectations the traditional org. structure with no ISR coordinator out performed the org. structure with an ISR coordinator – most evident in trial 1 (p < .055)

In trial 2, pattern quite different: teams in both organizational structures performed at about the same level in the high & low information load conditions

- Steep improvement (38%, p < .05) in performance for org. with ISR coord. in high information load condition
- Speculate that with sufficient training & practice org. with ISR coord. might prove superior
As predicted the confirming-disconfirming & disconfirming confirmation orders elicited different strengths of belief for an enemy attack (p < .06)
Tactical Judgment and Information Load

- No evidence of an order effect when information load is low
- Significant contrast (order effect) when information load is high

Low Information Load

High Information Load

The results demonstrated an order effect despite the fact:
- Participants had to glean the information from the Email/Intel traffic of over 75 messages
- Participants received the same information only in a different order
Conclusions

- Performance results did not support the prediction that an org. with an ISR coord. would out perform an org. without an ISR coord.
  - However, org. with an ISR coord. Caught up to the org. without an ISR coord. in trial 2 in both low & high information load conditions
  - Steep improvement may indicate presence of an ISR coord. does facilitate performance once sufficient training & practice have occurred
- Participants exhibited an order effect (a heuristic error) even though the confirmatory and disconfirmatory evidence was embedded in Email/Intel traffic
  - Order effect heuristic error strengthen by high information load
  - Suggest a problem related to network centric warfare that will have to be address