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“Adapting C2 to the 21<sup>st</sup> Century”

Team Performance in a Distributed Coalition Network

Network-Centric Experimentation and Application Track (1)

C2 Metrics and Assessment Track (2)

Organizational Issues Track (3)

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## Team Performance in a Distributed Coalition Network

### Abstract

Distributed teams representing multidisciplinary perspectives and operating in a collaborative information environment will define the future of Command and Control (C2). Multinational Experiment 4 (MNE 4) provided researchers an opportunity to evaluate how distributed teams interact in a collaborative, networked environment to conduct the Effects Based Approach to Operations (EBAO). Several team performance characteristics were evaluated. These included measurements of workload, perceptions of information quality, ability of subjects to develop trust in teams and the EBAO, team process dynamics, training evaluations, and the assignment of roles and responsibilities within teams.

Distributed teams were able to establish trust among members. However, not all teams were equally effective in assigning roles and responsibilities within the team and in establishing relationships with other teams, resulting in some confusion about the overall objective. Teams also reported an unequal distribution of effort, performance, and frustration, with the larger teams reporting increased workload, lower performance, and higher frustration. The impact of unequal staff teams is seen in the respondents' ratings of information quality. The average scores suggested that information was complete and sufficient, but less timely, understandable, and accurate. These findings are summarized and recommendations made for organizational design, collaborative system use, and training.

## Outline

1. Introduction: Why is team performance important to EBAO?
  - a. EBAO and the cognitive/social domains
  - b. How is team performance different in EBAO?
    - i. The structure of teams
      1. Distributed network
      2. Coalition partners
      3. Interagency partners
    - ii. The nature of the team process
      1. PMESII/DIME concerns
      2. roles & responsibilities
      3. interactions within and among teams
2. Methodology
  - a. Workload
    - i. NASA Task Load Index used as measurement tool
    - ii. Completed daily
    - iii. Respondents rated workload along six dimensions
      1. mental workload
      2. physical workload
      3. time pressure felt
      4. satisfaction with own performance
      5. effort
      6. frustration felt
  - b. Trust in Team and Technology
    - i. Five questions asked once during mid-experiment
      1. my team was open to ideas from all members
      2. I was comfortable sharing ideas with my team
      3. team members were kept informed
      4. collaborative technology made it possible for my ideas to be understood
      5. the collaborative technology used was efficient
    - ii. Questions were rated on a 7 point scale
  - c. Information quality
    - i. Ten questions measured participants' perceptions on the quality of information they received during the experiment process.
    - ii. Information was rated according to: accuracy, appropriateness, accessibility, relevance, timeliness, completeness, sufficiency, conciseness, interpretability, and understandability.
  - d. Team Process
    - i. Four questions measured perceptions of team process.
      1. effectiveness in sharing information
      2. effective in assigning roles
      3. effective in assigning responsibilities
      4. effective in communicating ideas

- ii. Questions were rated on a 7 point scale
  - e. Roles and Responsibilities
    - i. Four questions measured contributions to primary teams
      1. clear what was expected of me
      2. clear what was expected of others
      3. clear what other groups were to do
      4. clear how all groups should work together
    - ii. Questions were rated on a 7 point scale
  - f. Training
    - i. Two questions asked respondents to rate the quality of concept and tools training
    - ii. Questions were rated on a 7 point scale
- 3. Data collection and analysis
  - a. Workload analysis. A repeated measures Multivariate Analysis of Variance (MANOVA) was used to analyze the CTF MNE 4 workload survey data. Post hoc tests for the significant univariate t-tests were completed. Univariate analysis of variance (ANOVA) tests were used to determine what dimension of workload contributed to the significant interaction.
  - b. Trust in team and technology. The distributed, ad hoc teams reported high levels of trust in their primary team and in collaborative technology employed in MNE 4. The ANOVA revealed no significant differences between teams.
  - c. Information quality. The average scores suggested that information was complete and sufficient, but less timely, understandable, and accurate.
  - d. Team Process. Small teams reported high levels of assigned roles and responsibilities. Larger groups with more diverse responsibilities scored lower.
  - e. Roles and Responsibilities. This survey asked participants if they understood what they were to do with respect to others. Thus, if team leaders did not engage in specific assignment behaviors (Team Process survey), members might still understand their expectations. Two large and diverse groups reported, on average, that they had a lower understanding of their expected products than other groups.
  - f. Concept and Tools training did not achieve the anticipated goals of adequately preparing MNE 4 participants for the experiment.
- 4. Conclusions
  - a. Unequal effort and performance were documented among the distributed EBAO teams. This is an unhealthy state for an organization. We analyze possible reasons for this finding and offer organizational recommendations for EBAO.
  - b. The EBAO groups represented *ad hoc* teams formed to complete an operational headquarters. Most team members operated in a distributed (vice face to face) modality. Given these constraints to team work, most participants rated their trust in teams fairly high. This is a positive sign that *ad hoc* and distributed teams can, with minimal effort, create a situation where team members trust their teammates.
  - c. The perception of information quality as processed by the EBAO tasks was good. The report that information was plentiful, vice useful, is an important lesson.

d. Small team leaders were effective in assigning roles and responsibilities to their members as evidenced by the relatively high ratings for these survey questions compared to the larger and more diverse teams.

5. Recommendations (under development)

- a. Process
- b. Organizational
- c. Technology