Adaptability in Crisis Management: The Role of Organizational Structure

Marie-Eve Jobidon – DRDC Toronto
Alexandre Labrecque – Université Laval
Isabelle Turcotte – Université Laval
Vincent Rousseau – Université de Montréal
Sébastien Tremblay – Université Laval

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Overview

- Context of the study
- Crisis management
- Adaptability
- Experimental design and measures
- Results
- Conclusions
Context of the Study – The TASSCM Project

- Tracking Agility and Self-Synchronization in Crisis Management (TASSCM) project
  - Canadian DND-Academia-Industry research partnership

- Key objectives
  - Provide systematic characterization of agility and self-synchronization in teamwork
  - Enable and capture self-organizing behaviours
Crisis Management Teams

- Crisis management (CM):
  - Exercise of direction over resources in the accomplishment of specific goals and objectives in response to natural or human-made crisis events
  - CM teams are faced with sudden and unexpected events to which they must adapt

- Traditionally in CM, tasks, roles and resources are clearly assigned to each team member (functional organizational structure)
  - May limit teams’ ability to adapt to changing demands and unexpected events

- Edge organizations (EO): Flattening and decentralization of the traditional hierarchical structure
  - Proposed as potential solution for drawbacks of functional/hierarchical structures
  - Theorized to allow greater potential for flexibility and agility
    - Still limited empirical evidence
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Role of Roles

- Explicit role allocation is positively associated with team performance, team planning and shared situation awareness
  - But: CM teams need to be able to adjust their roles as needed during the execution of a task

- Potential issue with EO: Role ambiguity
  - Lack of clarity on team roles and responsibilities can hinder performance and teamwork

- Effectively balancing organizational flexibility and role ambiguity could make a military team more efficient and responsive
Adaptability

- Providing teams with the flexibility to adapt to evolving situations is at the core of EO

- Adaptability:
  - Undertaking effective actions when necessary, promptly responding to changing circumstances, and effectively adjusting plans to take the changes into account
    - Development or modification of structures, capabilities, behaviours and/or cognitive activities
  - Key teamwork competency, especially in complex and dynamic C2 situations
Objective of the Study

- Investigate how teams respond to sudden and unforeseen events in a CM situation
- Compare functional teams to edge-like teams
  - Do edge teams have greater flexibility and adaptability in the face of unexpected events?
  - Is there a cost of role ambiguity in decreased team effectiveness?
Microworld - C3Fire (Granlund, 2002)

- Simulated environment of command, control and communication
- Fires spread in real time, both autonomously and as a consequence of human actions
- Teams pursue multiple objectives:
  - Limit spread of the fire
  - Protect and save houses
  - Rescue population
Team Structures and Role Allocation

- 2 groups of 24 four-person teams

Function-based

Edge
Design: Scenarios & Stressors

- 4 scenarios with 2 stressors:
  - Workload and time pressure (high/low)
  - Workload = Unforeseen event that causes sudden transitions in workload
    - Event is an unexpected 2nd fire
  - Time pressure = Faster propagation
    - Changes in wind speed and direction
- Realistic scenarios, tuned for difficulty via pilot testing
Design: Timeline

S = Scenario
Q = Post-scenario questionnaires
Measures

Measures of performance and teamwork are calculated as follows:

Performance:

\[
\text{Total number of cells extinguished}
\]

\[
\text{2 minutes}
\]

Activity level:

\[
\text{Total number of commands}
\]

\[
\text{2 minutes}
\]
Adaptability

- Can teams adapt to sudden events that occur unexpectedly during the mission?

- A period of 2 min after detection of the critical event is compared to the 2-min period before detection:

\[
\text{Adaptability Score} = \frac{\text{Score after the unexpected event}}{\text{Score before + after the unexpected event}} \div 0.5
\]
Adaptability ratio for performance and activity level as a function of team structure
Mean performance as a function of the discovery of the 2nd fire and team structure
Activity Level

Activity level as a function of the discovery of the 2\textsuperscript{nd} fire and team structure
Discussion

- Edge teams perform better prior to critical event, but functional teams appear to adapt more effectively shortly after the event.
- Adaptability of edge teams following the 2nd fire, as shown by activity level, varied more across teams than for functional teams.
- Suggests that the critical event had a greater impact on edge teams than functional teams.
  - Role allocation in edge teams is less explicit; may lead to greater confusion when having to deal with unexpected events.
- Provides evidence that flexibility afforded by edge structure can lead to variances in how teams go about their task.
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Conclusions

- Edge teams took advantage of their flexibility but there seems to be a cost in terms of performance, at least shortly after event.

Further work

- Later time periods (beyond 2 minutes)
- Analyses of communication
- Other teamwork indicators (e.g., to identify patterns in role and resources allocation)

Potential costs/benefits of more flexible structures like EO could be compounded in underdeveloped and degraded op environment

- Elements important for collaboration and mission success could be hindered
- Potential flexibility and adaptability could be assets under some of these degraded conditions