



Adaptability in Crisis Management: The Role of Organizational Structure

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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



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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

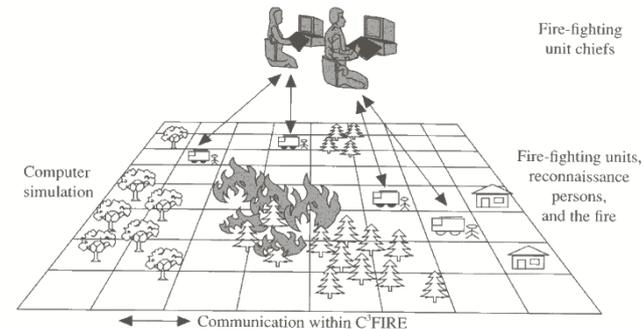
- Investigate how teams respond to sudden and unforeseen events in a CM situation
- Compare functional teams to edge-like teams
 - Do edge teams have greater flexibility and adaptability in the face of unexpected events?
 - Is there a cost of role ambiguity in decreased team effectiveness?



Microworld - C3Fire (Granlund, 2002)



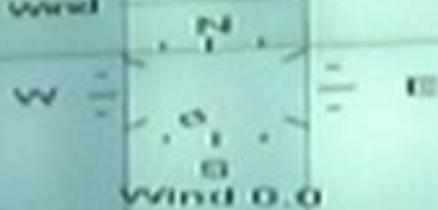
- Simulated environment of command, control and communication
- Fires spread in real time, both autonomously and as a consequence of human actions
- Teams pursue multiple objectives:
 - Limit spread of the fire
 - Protect and save houses
 - Rescue population



Time

02:20:30

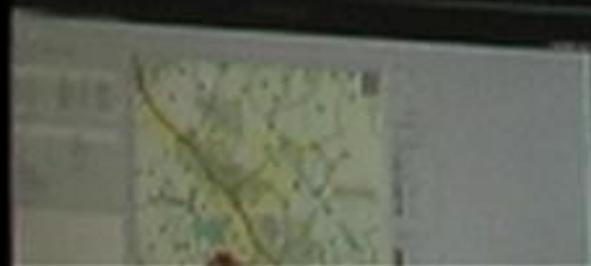
Wind



Wind 0.0

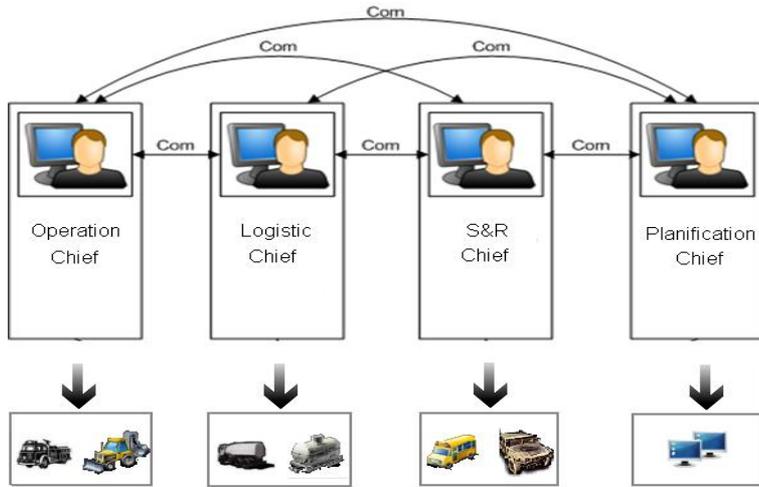


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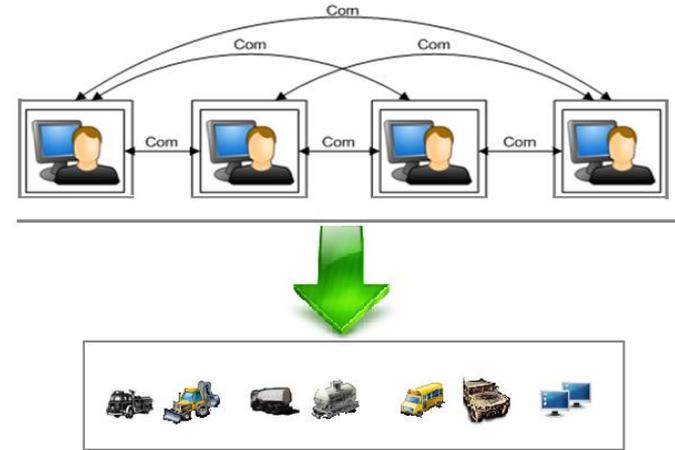


Team Structures and Role Allocation

- 2 groups of 24 four-person teams



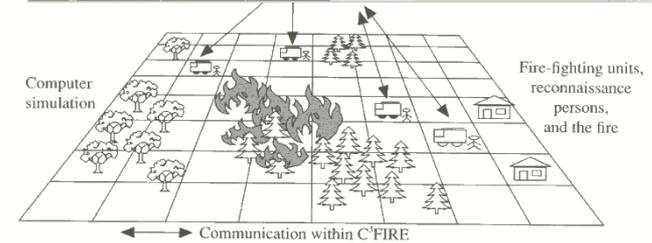
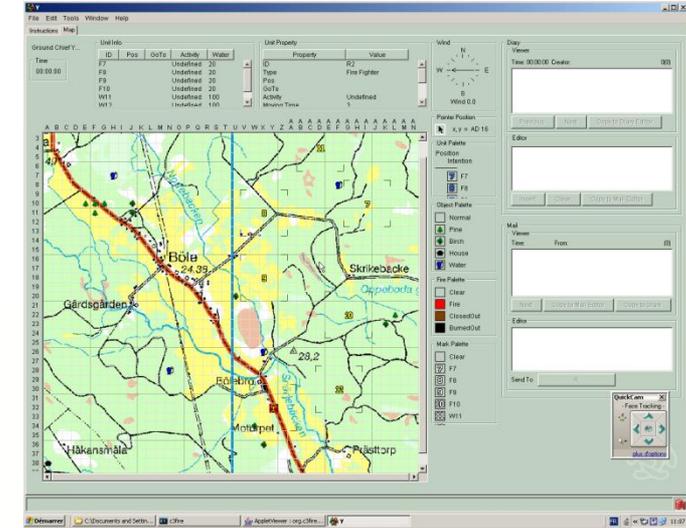
Function-based



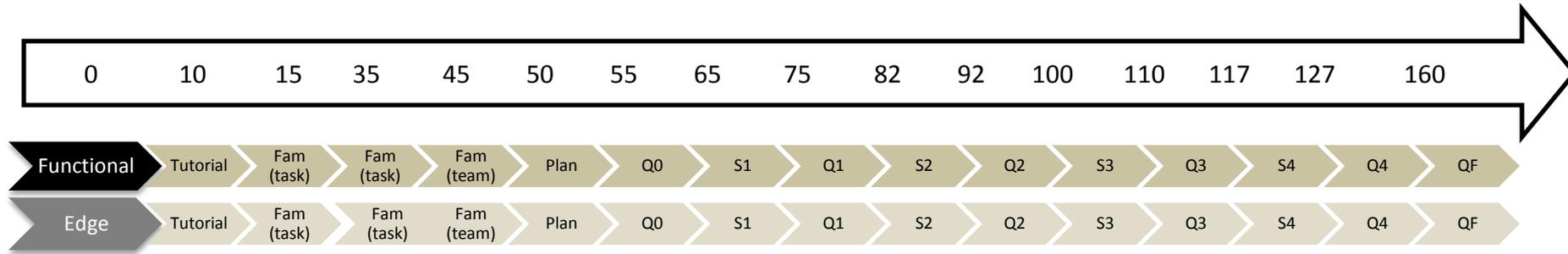
Edge

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:
$$\frac{\textit{Total number of cells extinguished}}{\textit{2 minutes}}$$

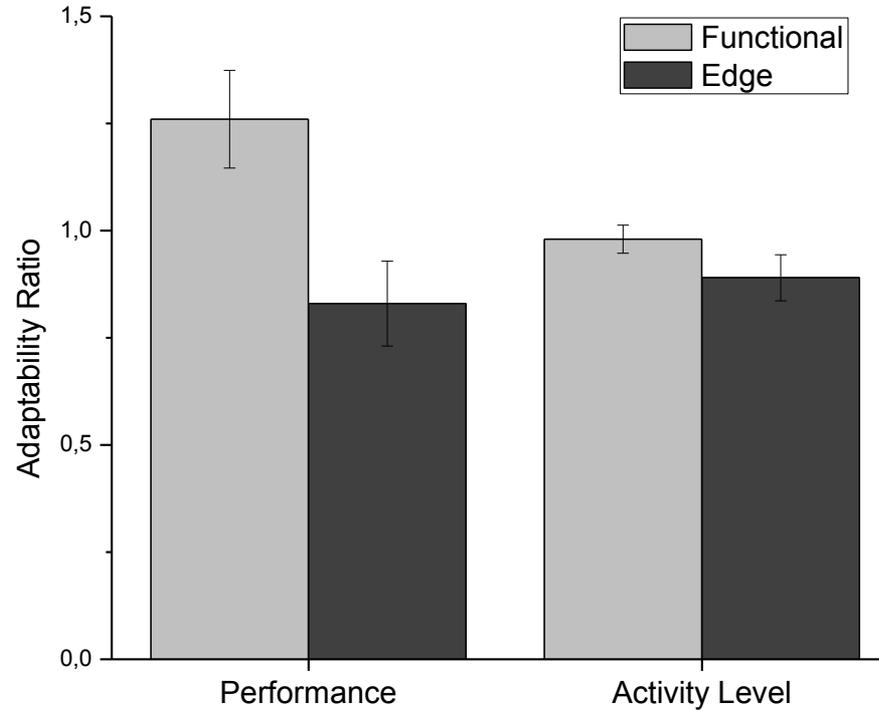
Activity level:
$$\frac{\textit{Total number of commands}}{\textit{2 minutes}}$$

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:

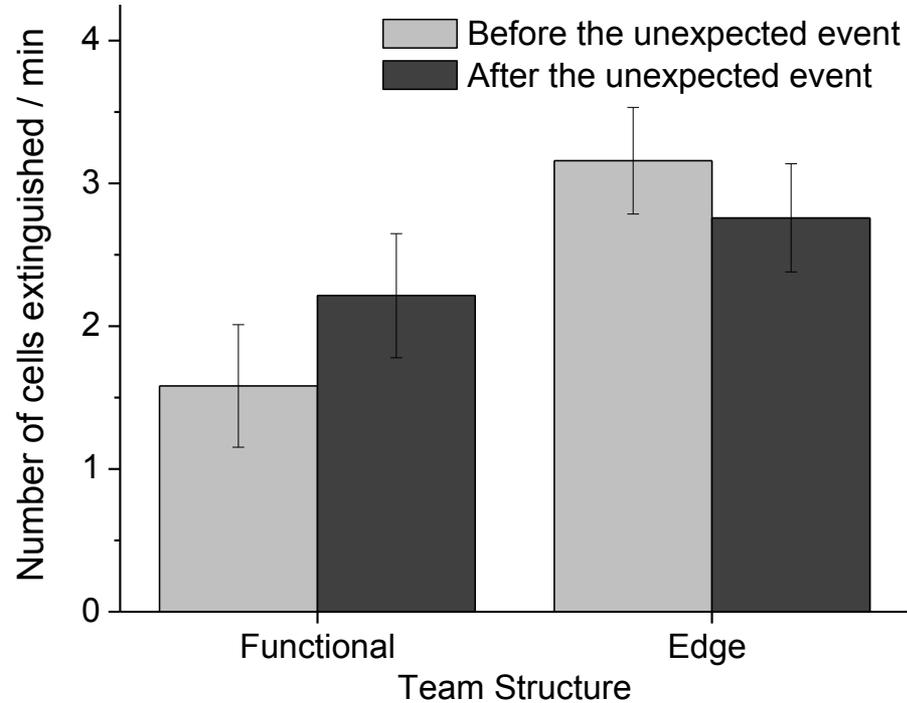
$$\text{Adaptability Score} = \frac{\text{Score after the unexpected event}}{\text{Score before + after the unexpected event}} \div 0.5$$

Adaptability Ratio



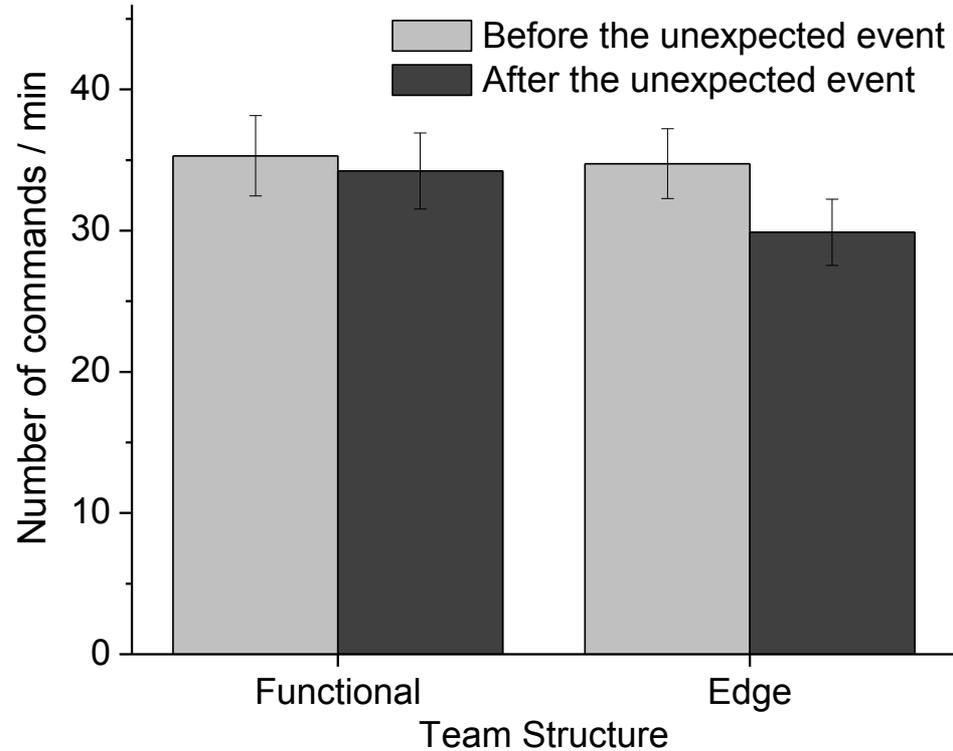
Adaptability ratio for performance and activity level as a function of team structure

Team Performance



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 2nd 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



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