

# **Challenges to Cognition and Coordination in an Incident Management Team (IMT): A Model-Based Systems Engineering (MBSE) Approach**

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## **Abstract**

To protect and assist threatened populations and infrastructures in response to natural and man-made disasters, emergency responders from diverse backgrounds collectively work as ad hoc teams. However, their collective response efforts have not been adequately addressed in terms of team cognition and coordination. We view team cognition as a collective cognitive process to complete tasks in a coordinated manner, and accordingly, an understanding of team coordination necessitates an understanding of team cognition. In this study, we are particularly interested in cognition and coordination of an incident management team (IMT), an ad hoc team of command-level responders co-located at the incident command post of a major incident such as Hurricane Harvey. To develop and provide an incident action plan to subordinate branch directors or supervisors in the field, an IMT continuously manages information based on incoming cues from outside, following a cyclical planning process. Interestingly, an IMT is a team of functional sub-teams or sections (i.e., Command, Planning, Operations, Logistics, and Finance/Administration). Within each sub-team there is also a team of functional units. For a successful response, it is essential to understand how an IMT coordinates as a team-of-teams (or a system-of-systems) embedded in complex sociotechnical systems. Thus, the purpose of this on-going study is to investigate challenges to cognition and coordination of an IMT via a model-based systems engineering (MBSE) approach. In contrast to traditional document-based approach, a MBSE approach facilitates the construction of a coherent model of the complex system being developed and the transformation of the model into a real system design (Ramos et al., 2012). From a direct observation of an IMT in a high-fidelity simulated environment, we will present a descriptive model of an IMT as a team-of-teams and propose what challenges to cognition and coordination worth further investigation in future work.

## **References**

Ramos, A. L., Ferreira, J. V., & Barceló, J. (2012). Model-based systems engineering: An emerging approach for modern systems. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, 42(1), 101-111.