

Knowledge Based Engineering Assessment of C4SI Digitized Battlefield Experiments

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Abstract

The U.S. Army Research Laboratory (ARL) has undertaken a research program aimed at better understanding the distributed, non-linear decision-making process at the brigade level and above, as it is shaped by time, stress, team structure, staff experience, the environment, and the introduction of computer technology. Critical battle command tasks were quantified using response data from key Tactical Operations Control (TOC) staff during several Advanced Warfighting Experiments based on ARL structured Knowledge Based System metrics (KBSM). The KBSM is a data collection instrument designed to facilitate recording key battle command data elements through surveys and interviews related to battle command computer assisted tasks made by commanders, staff officers and operators during U.S. Army experiments and exercises. The metrics incorporate recent theories of cognitive science and organizational psychology. Thus, a framework for assessing digital staff performance is established that considers, hardware, battle command functions, soldier operator capabilities as well as staff and leader dynamics. The KBSM was also designed, in part, as the data collection complement to cognitive and knowledge based engineering models of the decision making process, as a major component of the "Cognitive Engineering of the Human-Computer Interface for Army Battle Command Systems (ABCS)" project. The purpose of this paper is to present an approach to data collection, analysis, and classification of critical decision events using multivariate and non-parametric statistical techniques. Key findings from past Advanced Warfighting Experiments and field studies are presented.

Key Words: Knowledge Based Engineering, Army's Battle Command System, performance metrics, behavior anchor scales, soldier system interface, cluster analysis, categorical data.