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In the Army's Future Combat System (FCS), leaders will have access to a plethora of information from many sources. The commander's dilemma will be to use that information to make high-valued decisions throughout mission duration. FCS requires cognitive decision aids to enable rapid decision-action cycles. Dynamic Decision Networks (DDNs) have been designed to help achieve this goal.

DDNs combine the processing power of Bayesian Networks and the multi-attribute decision capability of Influence Diagrams to address the use of information in evolving, uncertain situations. This combination of properties is directly responsive to the needs of FCS, and it extends to many classes of complex problems beyond the military.

We provide the theoretical foundation of DDNs, and consider why DDNs were designed as an alternative to Dynamic Programming (DP). DDNs provide insights for problems where the timing of decisions is critical, particularly when the problems have many variables and the amount of uncertainty varies over time. We show that DDNs are often a good approximation to DP.

We discuss the development of robust value models, review sample models that automate FCS-related decisions, and demonstrate the automation of the DDN software environment we have created. (Received September 25, 2006)