



ACQUISITION INNOVATION  
RESEARCH CENTER

## INCUBATOR EXECUTIVE SUMMARY | 2022

# MANAGEMENT AND BUSINESS KNOWLEDGE REPRESENTATION FOR DECISION MAKING



NAVAL  
POSTGRADUATE  
SCHOOL

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*This material is based upon work supported, in whole or in part, by the U.S. Department of Defense through the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) and the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) under Contract HQ0034-19-D-0003, TO#0309.*

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## BACKGROUND AND PURPOSE

“That’s the way we’ve always done it” is a well-known mantra and impediment to change. But why did we make the decisions we made? What was the context and rationale? This paper describes an approach to answer these questions, empowering leaders to make effective, lasting change to improve decision making.

Led by Principal Investigator Dr. Johnathan Mun (Naval Postgraduate School) the research takes a multidisciplinary approach and includes an examination of state-of-the-art precedent-based decision-making. This first-phase incubator research looks at how the Department of Defense (DoD) can inculcate institutional corporate memory. This will help DoD senior leadership to make more credible and defensible program funding decisions, i.e., where, how much, and how long to invest.

The objective of this incubator project is to generate a transparent Decisions Options Register (DOR) database system that is integrated and intelligent, capturing all historical decisions (assumptions, data inputs, constraints, limitations, competing objectives, and decision rules). Information in this DOR will be compatible with meta-semantic searches and data science analytical engines. Decision-making based on precedence will address the DoD’s loss of institutional knowledge when employees leave or are reassigned elsewhere. The goal is to provide decision-makers actionable intelligence and visibility into future decision options, complete with the assumptions that led to certain comparable decisions in the past.

## RESULTS

Phase I of this project provides example case applications and mock-up DORs complete with stylized data and examples to illustrate the capabilities of the multidisciplinary, integrated methodology. The applied techniques are shown to provide decision makers with options based on their most important criteria and support the identification of factors critical to the success or failure of decisions within a program or acquisition. The analytical approaches used in the case study are objective, verifiable, repeatable, and extensible, and may be adjusted to accommodate new constraints and limits. The research applies multiple novel approaches to enhance its success in generating a powerful and searchable DOR database and enables the recommended DOR and associated methodologies to compute probabilities of new program success and failure by looking at characteristics and historical data to predict outcomes. The current research provides a steppingstone to the next phase’s multiyear research where actual data can be run through the prescribed analytical engines.

## NEXT STEPS

Phase II research will include discussions with key DoD personnel, subject matter experts, key decision-makers, and program managers to determine a roadmap to enhance the success of generating a searchable DOR database. It is proposed that follow-up research include the following:

- Apply the portfolio optimization methodology to a real-world case study involving the U.S. Navy, using real-world data, and tracking project outcomes over time.
- Create new or evaluate existing concepts of military value that incorporate: data validity tests; big data analysis; backcasting using historical data; creating lighthouse events and programs in the past and using these as guideposts for generating future SME estimates; and more exact definitions and methods for SME assumptions.
- Utilize multi-objective optimization that considers and reconciles interdependencies and competing stakeholder needs.
- Evaluate and compare analytical hierarchical processes, multi-objective optimization, and other algorithms.

Results from Phase II will deliver practical knowledge which can be applied to implement and scale use of DORs across the Defense Acquisition enterprise.