AIRC | ACQUISITION INNOVATION RESEARCH CENTER

# The Acquisition Innovation Research Center:

## Innovation for Digital Transformation and Policy Analytics

EXECUTIVE SUMMARY
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# EXECUTIVE SUMMARY

This report presents the initial results of an AIRC Policy Test Laboratory (PTL) study and was performed by the research team over a period of two months. The goal of this project was to establish an initial reference architecture to support the development of the PTL.

The government has identified several obstacles to inform effective and efficient acquisition policies. Effective modeling, simulation, and analysis of acquisition policies require a multi-domain, multi-scale approach. However, existing research in acquisition policy analysis has primarily remained siloed. Policy researchers lack a platform that enables sharing, reusing, or integrating the methods, models, and data developed and/or generated by different research teams in different projects. Government envisions a PTL as a potential solution to this need. The PTL is conceived as a service where a domain model developed in a project can be used and/or integrated with another model of a different domain developed in a different project.

The need for multidisciplinary modeling and the integration of heterogeneous models has been identified in other research fields. Efforts with different scopes and goals are undergoing, with different approaches in both technical and organizational governance. Some efforts focus on developing an integrated model out of which research questions may be addressed. Some efforts focus on enabling integration of models to let integration efforts emerge to respond to a wider variety of research questions. These existing efforts were assessed based on their background, goal, maturity (or state of the development), types of research questions they can support and application domains they serve, kinds of disciplinary models, data, and tools they are intended to support, architecture, and technical and organizational governance. This assessment has been used to increase the understanding of what type of approach may better fit the needs of the Department of Defense (DoD) to support acquisition research.

The reference architecture for the PTL is defined as a set of guidelines and constraints that will enable (1) the sharing and use across acquisition research projects of data, models, and tools, and (2) the construction and composition of multi-disciplinary models of government acquisition, that addresses both technical and governing aspects. A layered reference architecture is proposed. The Application layer handles aspects related to how organizations and infrastructure engage (e.g., security aspects or UI/UX). The Problem class/Research question layer handles aspects related to assessing if a given task can be supported by the PTL (as an integrated assessment tool). The Models, Data, Tools layer handles the actual research artifacts indicated by their names. The Infrastructure layer handles all aspects related to hosting, storing, and exchanging the research artifacts with the PTL consumers. The specific design of each layer embeds elements that contribute to trust and to model composability. The use of standard metadata accompanying the models, data, and tools injected into the PTL has been found to be a key asset to support interoperability. While some standards exist, they seem to be tailored to specific application domains. A new standard is required for the reference architecture of the PTL.

Given a lack of clarity on the existence of commonality or agreements related to modeling in acquisition-related research, a bottom-up implementation approach is suggested initially. The basic idea consists of, first, not constraining the work of AIRC researchers to specific models, tools, or modeling approaches. Instead, AIRC researchers are requested to deliver a set of artifacts (and metadata) associated with the models, datasets, and tools they generate during their project. These are then consolidated and aggregated by an AIRC team, resulting in a PTL that will grow larger, more mature, and more capable with every new AIRC sponsored project. As the PTL matures, AIRC could incorporate additional constraints to be met by AIRC researchers to facilitate integrability with the PTL. It is anticipated that this implementation plan requires minimal upfront effort, which will organically increase as the maturity and capabilities of the PTL increase.

As a start, it is recommended that every AIRC award should incorporate an appendix to their contracts that require every awardee to deliver the following artifacts at the completion of their project:

- An Interface Control Document (ICD) for every model, dataset, and tool that they generate and/or deliver in their project.
- An ontology that captures all elements (objects, definitions, relationships) included in the models, datasets, and tools generated and/or delivered in their project.
- A repository that hosts every model, dataset, and tool they generate and/or deliver in their project, and that makes them available for use by any other AIRC researcher.

For sustainment of the PTL, six major tasks have been identified:

1. Ontology development;
2. Problem class taxonomy development;
3. Infrastructure & application layers development;
4. Data & models review and curation;
5. Study review and curation;
6. General sustainment.

These will require the setup and funding of dedicated teams under AIRC sponsoring.

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