

Managing Retention Use of Simulation and Optimization

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Report Documentation Page

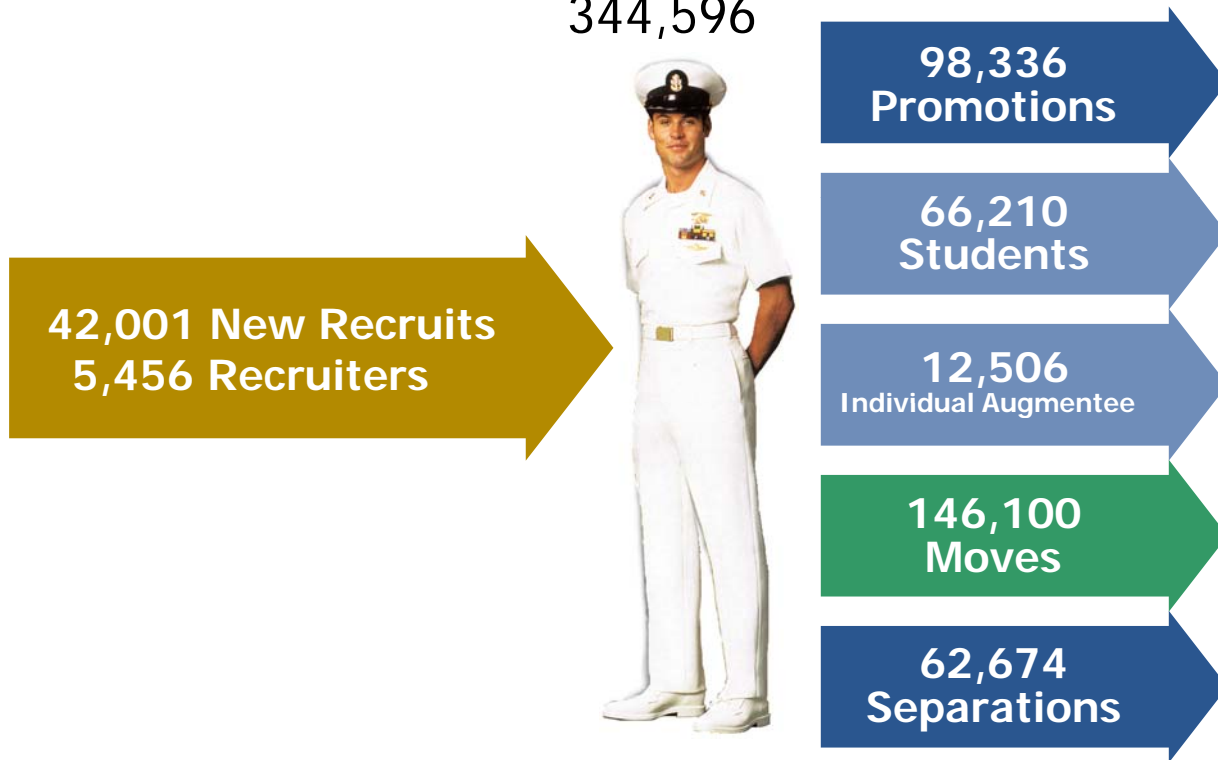
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DoN Personnel Enterprise: Large, Complex Business

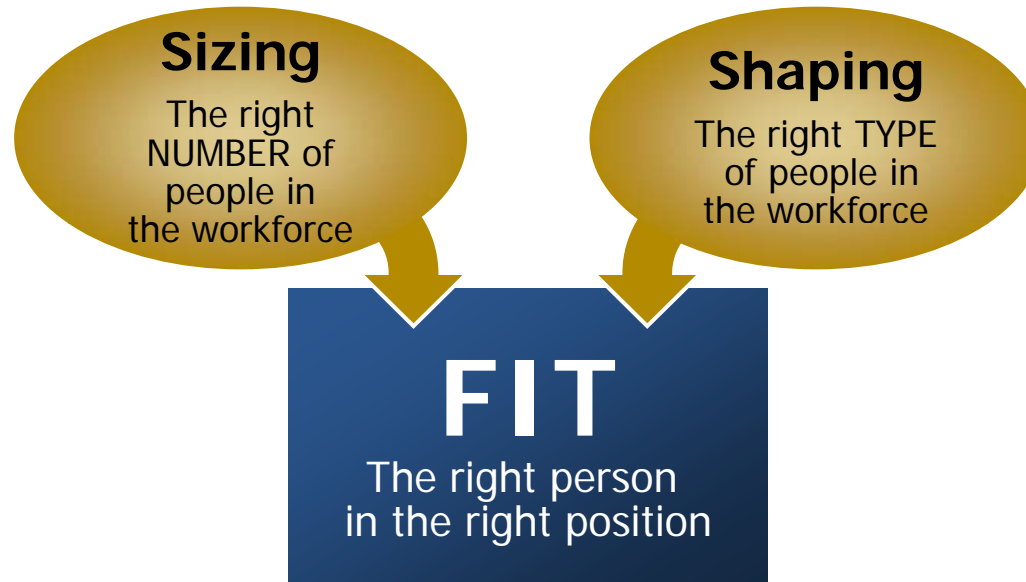
Active Duty Enlisted and Officers
344,596



\$25.9B Personnel Budget
\$2.1B Training Budget



Measuring MPTE's Performance

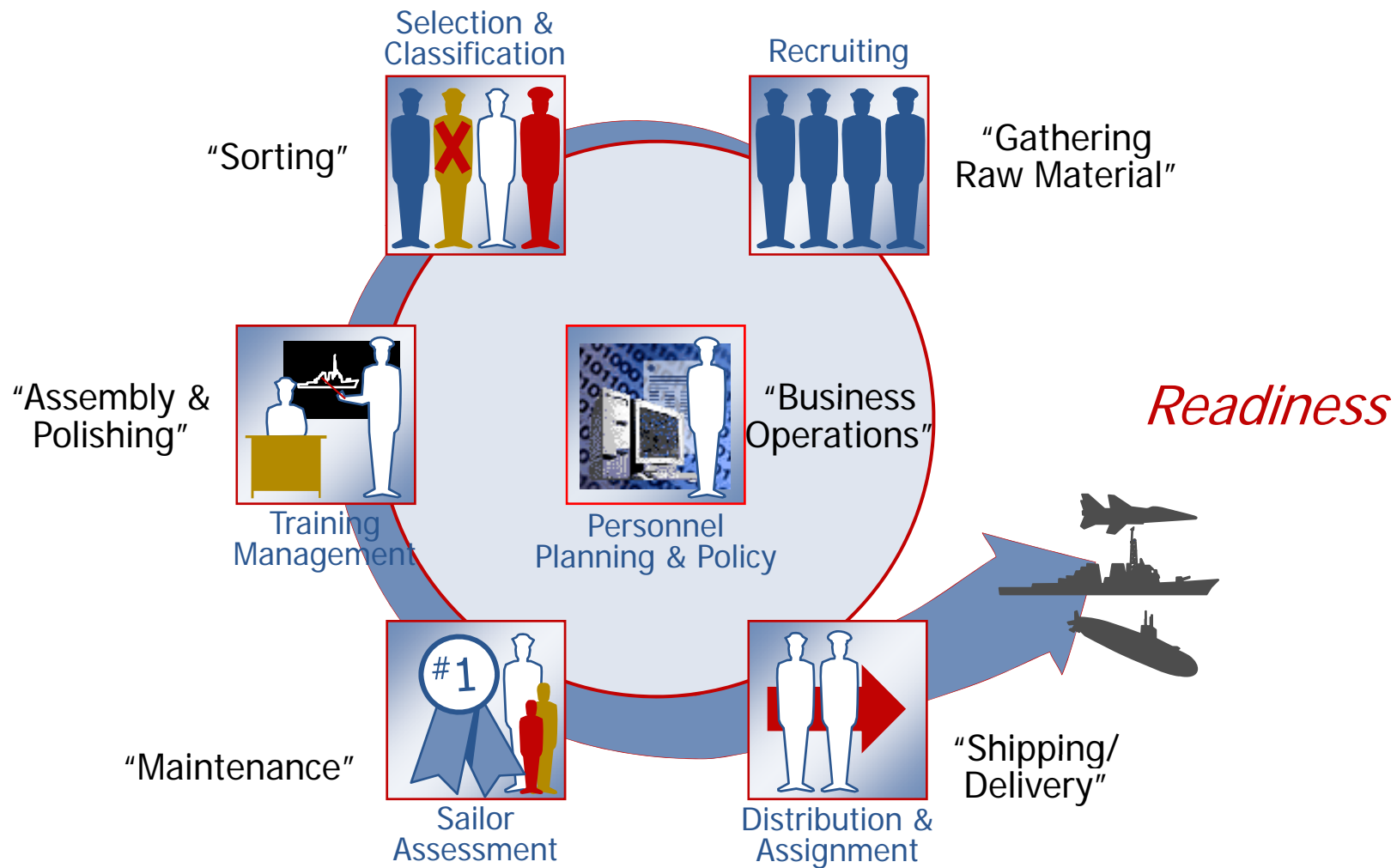


. . . . "Today, we are focused on shaping and stabilizing the force – ensuring we have the right fit between the knowledge, skills and abilities required by a billet and those possessed by the Sailor, Navy Civilian or Contractor filling that billet . . . "

Excerpt from "Strategy for Our People" signed by then CNO ADM Mullen 01 Sept 2007

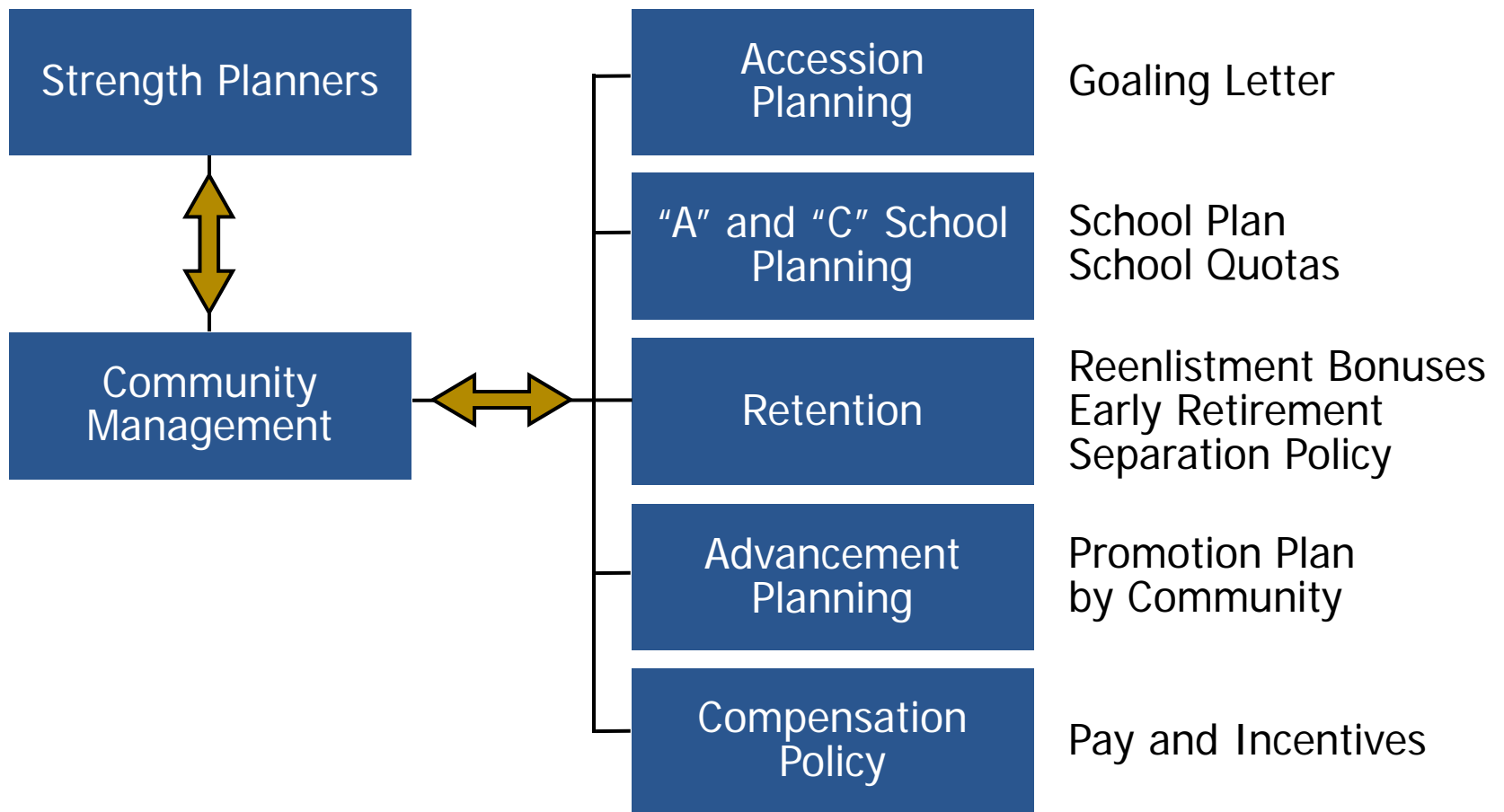


The MPTE Supply Chain



Strength Planning and Community Management

318,000 Sailors in 95 Communities

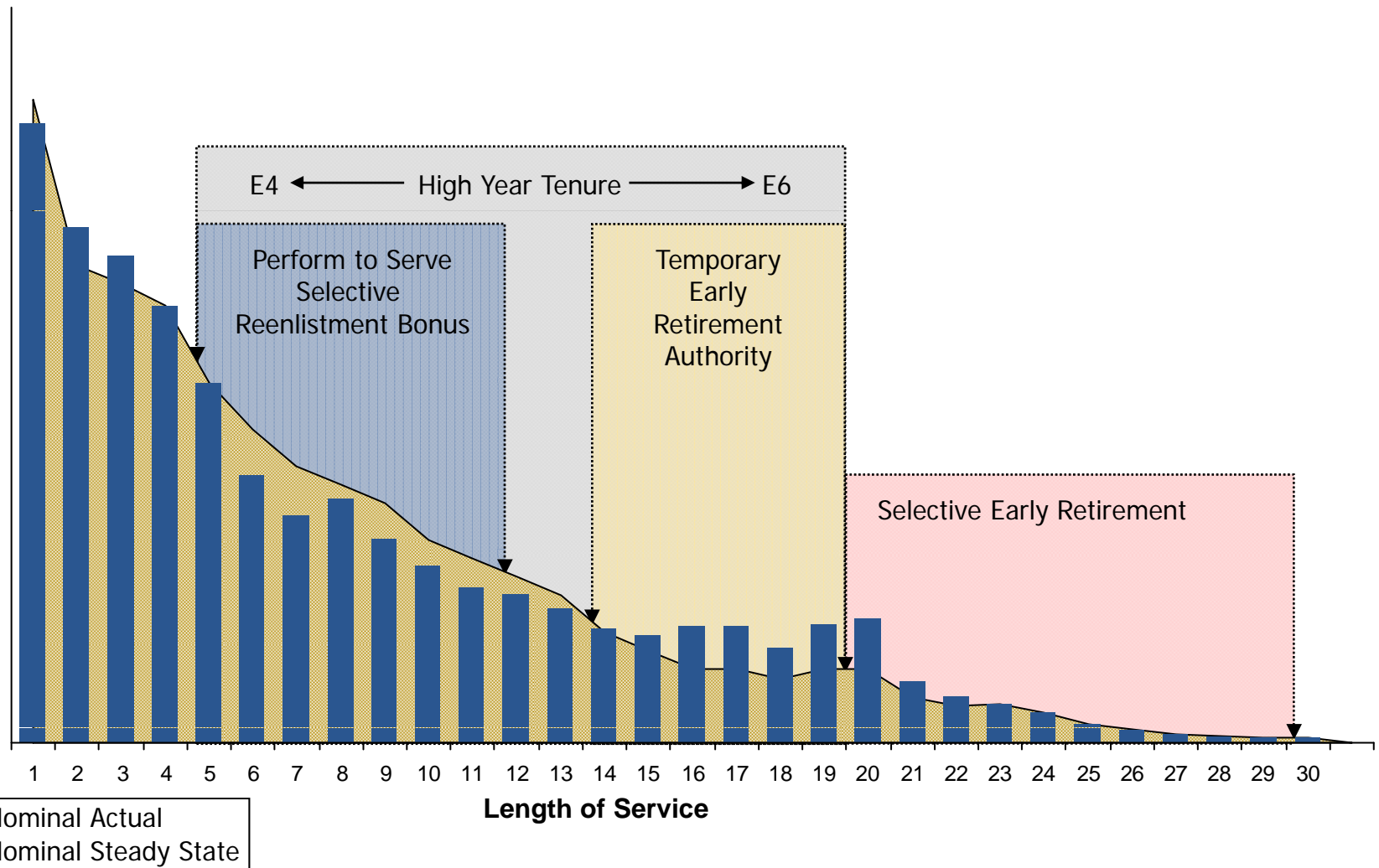


NPRST



Force Shaping Tools Managing Losses and Excesses

NPRST



Existing Navy Manpower Models

- Designed to address very specific questions
- Functionally oriented
- Employ statistical analysis approach
 - Collect past performance data
 - Identify correlations between key parameters and outcomes
 - Extrapolate to predict future outcomes



Operational Problem

- Current Navy personnel models are inadequate because they:
 - Have a narrowly focused problem domain
 - Lack sensitivity analysis capability
 - Do not easily adapt to new information
 - Do not capture interaction effects
 - Do not capture Navy Fit metrics
 - Lack readiness, cost and risk tradeoff analysis



Objective

- To supply timely, accessible, accurate and reliable information that supports Navy personnel decision making:
 - Leverage available data sources to improve analysis and forecasts
 - Evaluate alternative enterprise policies and resource options
 - Improve visibility over cost drivers of mission readiness



Technical Approach

- Develop integrated system of predictive analysis tools to support:
 - Policy analysis
 - Strategic planning
 - Resource programming
- Leverage agent-based simulation to integrate
 - Quality of Life factors
 - Social and Economic factors
 - Monetary and non-monetary incentives



Core Technology: Agent Based Modeling

- Construct a virtual environment populated by agents
- Set initial conditions
- Define agent behavioral responses
- Allow events to drive agent interactions
- Run simulations to observe emergent behaviors



Advantages of Agent Based Modeling

- Allows for experimentation to identify appropriate institutional design
- Permits systematic experimental study of complex processes in general.
- Facilitates creative experimentation with realistic processes:
 - Modular structure permits relatively easy modification/extension of features.



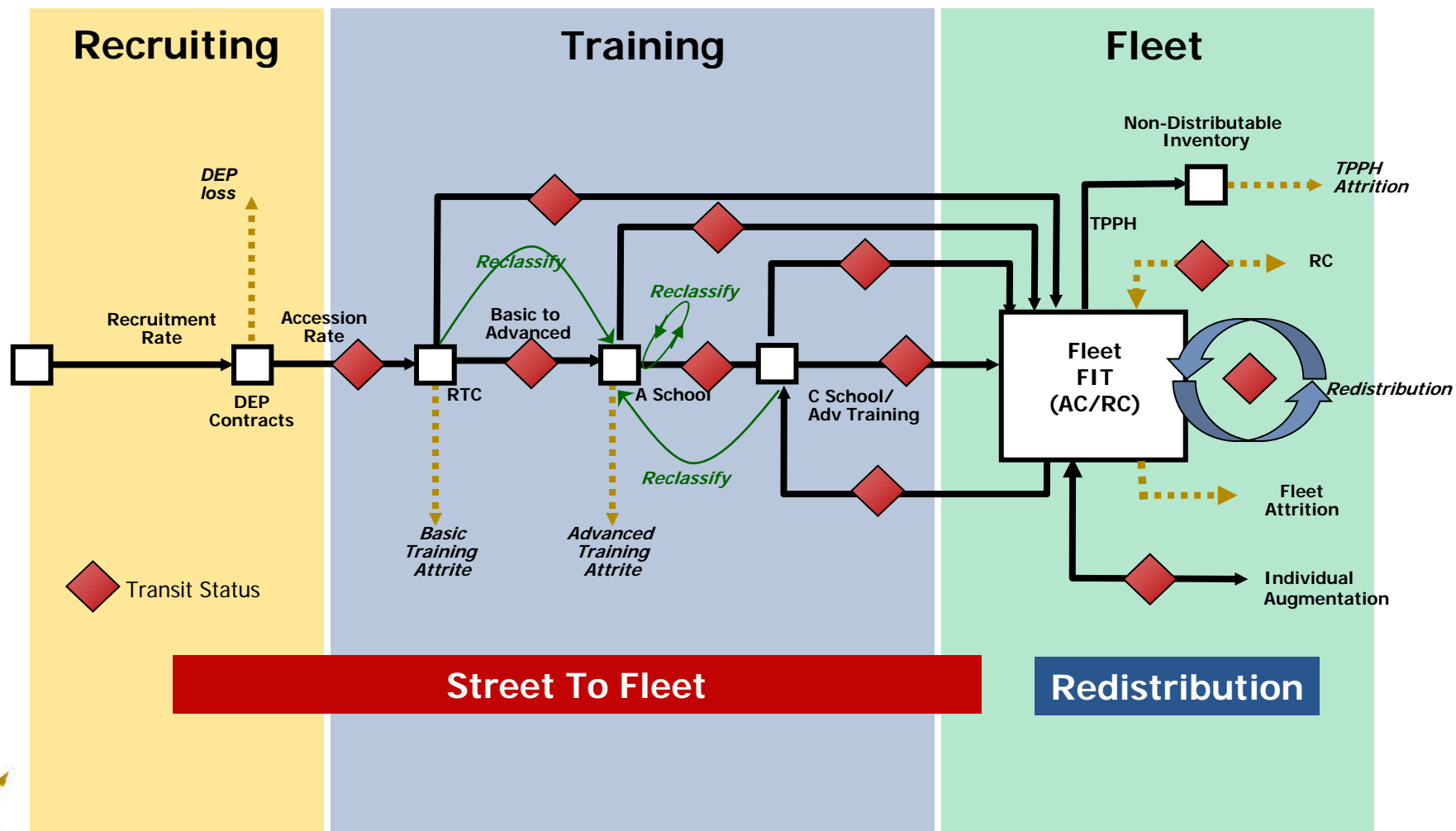
Navy Personnel Agent Based Modeling

Simulate the Navy's manpower & personnel processes from a bottom-up point of view

- Assign attributes to each sailor agent
- Defined business rules for agent behavior
- Allow external environment to influence behavior
- Allow agents to interact with other agents
- Observe Skill community and overall Navy emergent behaviors



Navy Personnel Supply Chain



Behavioral Economics

- Examine psychological effects that distort standard utility maximizing models
- Identify incentives for skill acquisition and market clearing pay rates
- Utilize social utility experiments to evaluate the influence of fairness on groups that exhibit reciprocally fair behavior
- Incorporate behavioral constructs of individual decision-making and choice behavior into agent design

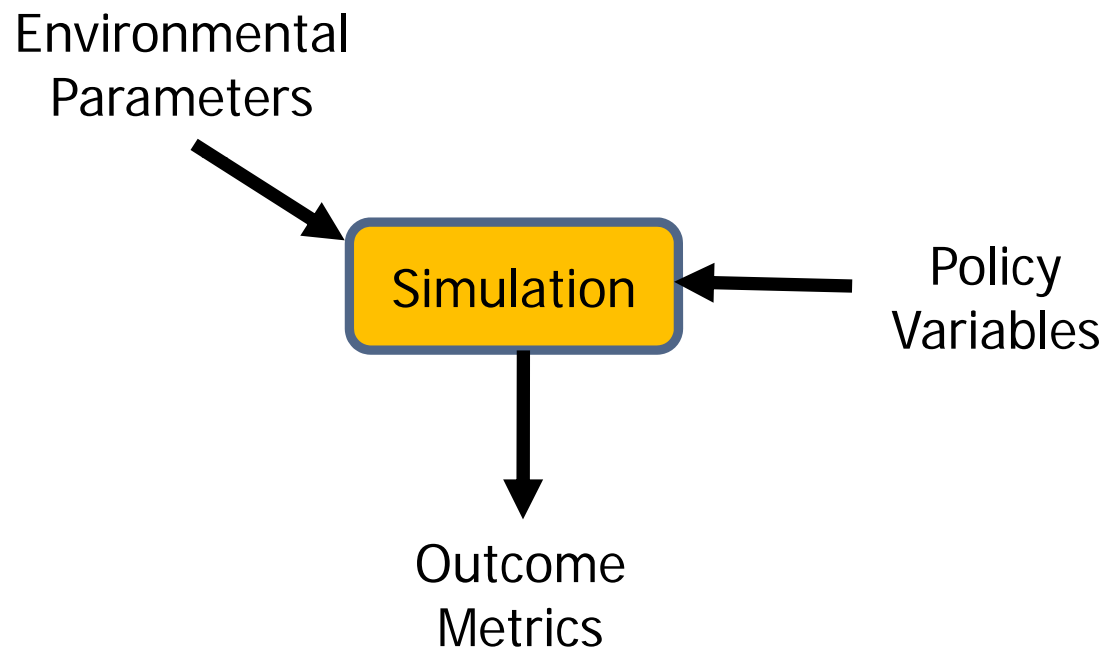


Data Mining

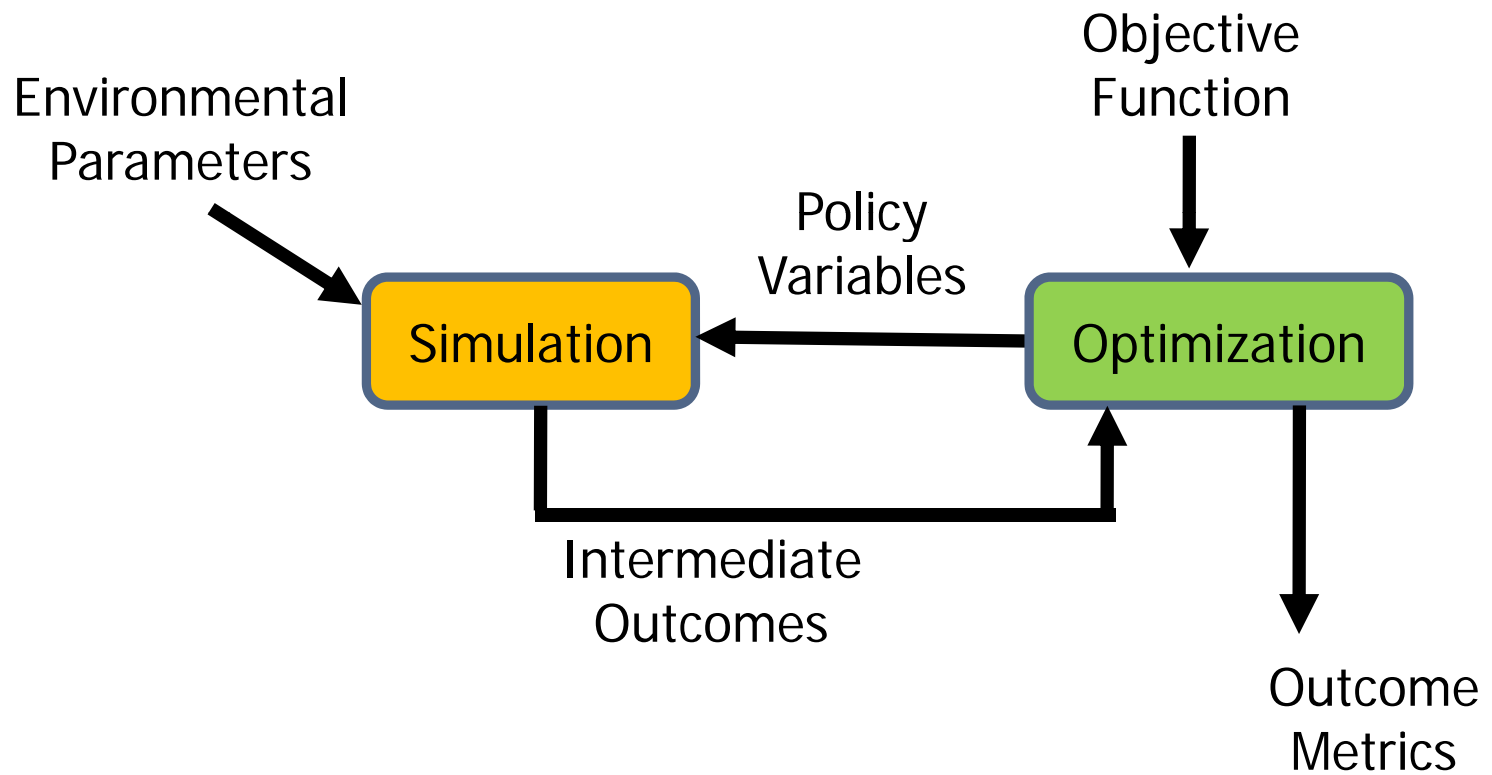
- Analyze archival survey data to correlate attitudes with future behaviors
- Integrate attitudinal data into traditional econometric retention models
- Incorporate enhanced retention models into agent design



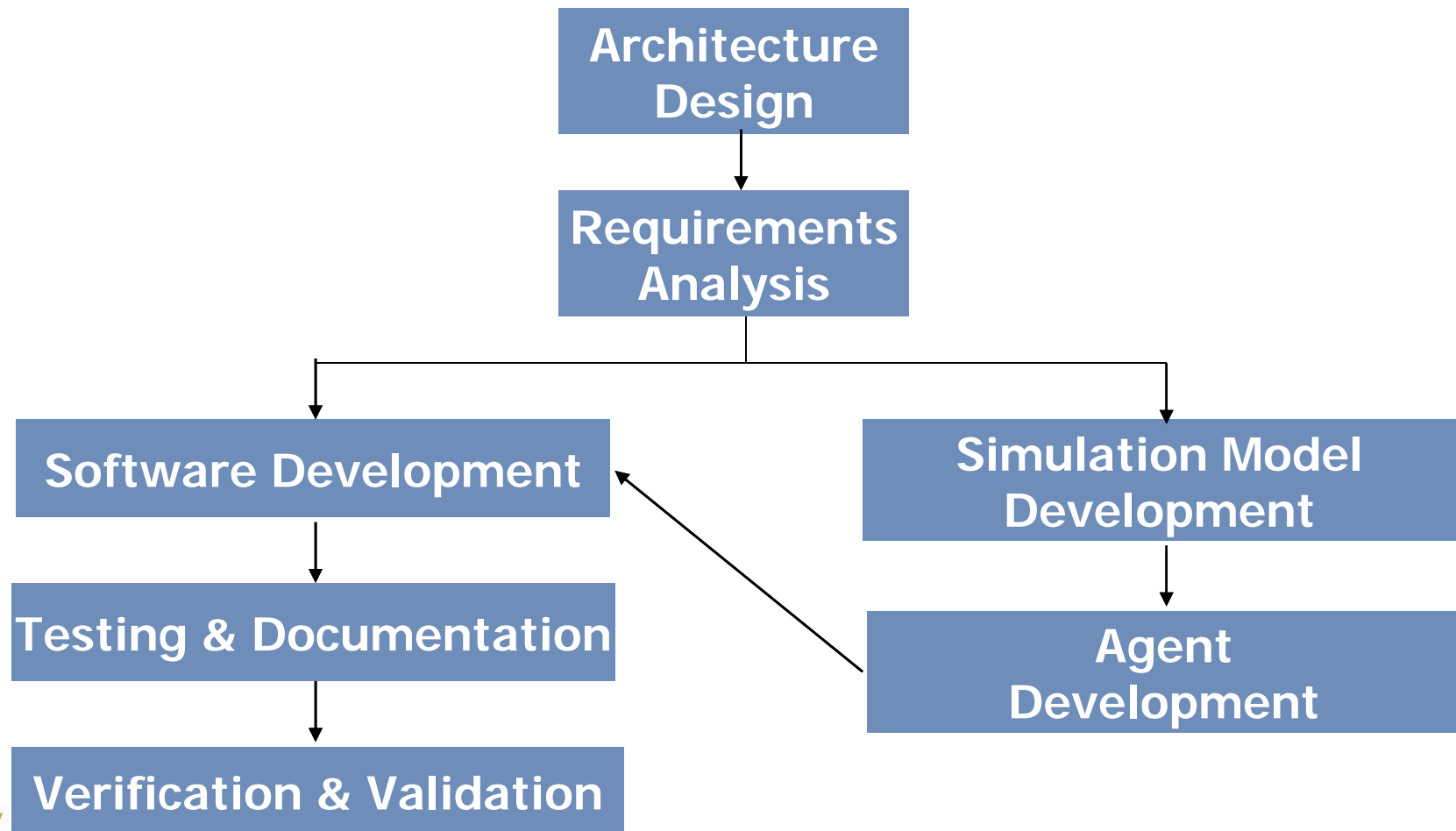
Basic Simulation



Simulation and Optimization



Program Design



Risks and Mitigation Plans

- Risks
 - Developing a quantitative measure of mission readiness, a key metric for the proposed effort
 - The design complexity of Agent-Based models and large number of potential agents
- Mitigation
 - Alternative approaches to current readiness calculation (FIT) will be developed and evaluated in the simulation environment



Measures of Success and Payoff

- Delivery of simulation environment that yields insight into effects of policies on
 - Readiness
 - Cost
- Predictive tools that inform leadership of potential challenges and allows analysis of mitigation alternatives

