



The Systems Engineering Research Center UARC

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www.stevens.edu/SERC



SERC Mission and Sponsors

The mission of the Systems Engineering Research Center is to enhance and enable the DoD's capability in Systems Engineering for the successful development, integration, testing and sustainability of complex defense systems, services and enterprises.



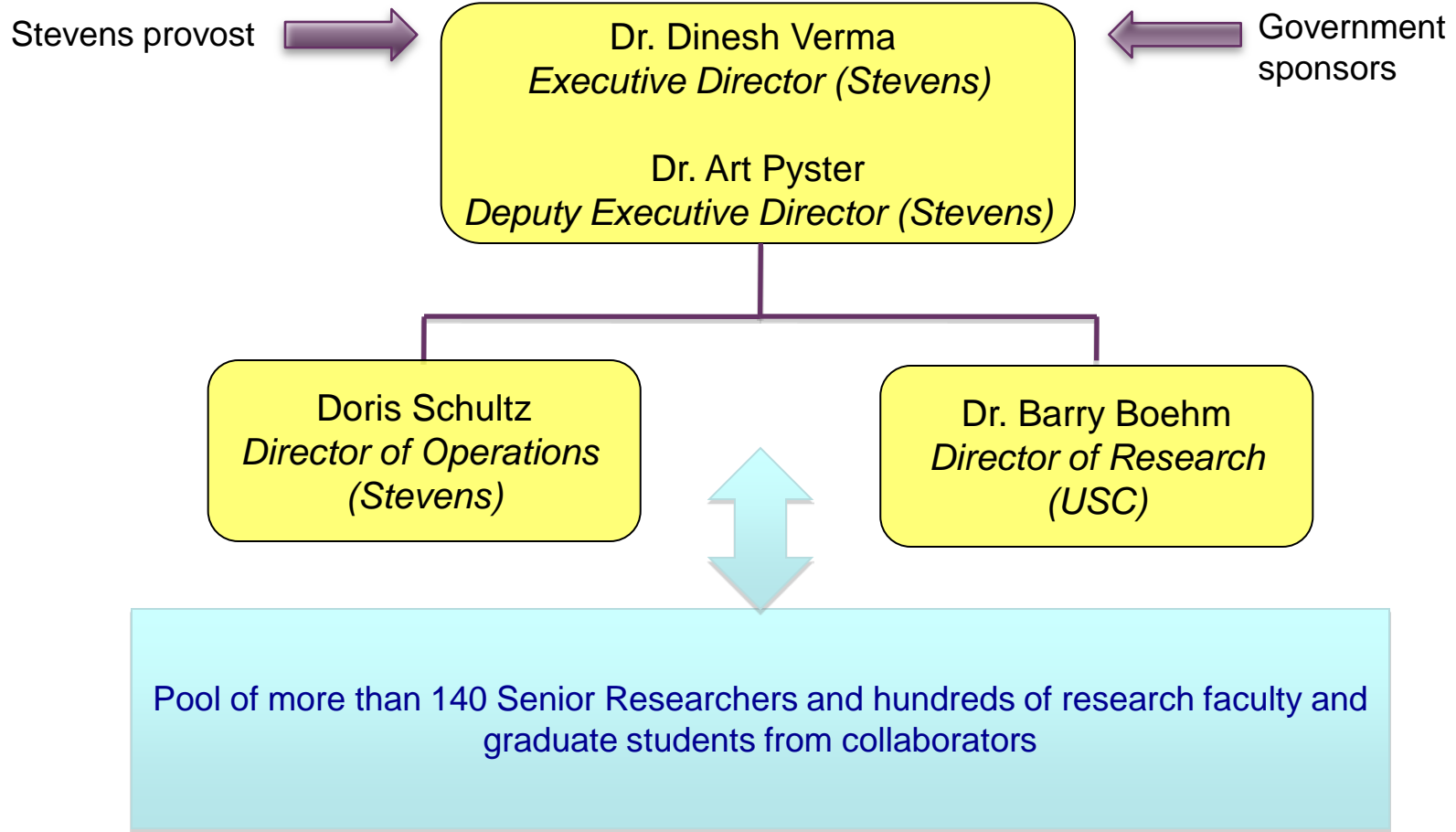
Vision

DoD and IC systems achieving mission outcomes – enabled by research leading to transformational SE methods, processes, and tools.

Objectives

The SERC will be the primary engine for defense and intelligence community SE basic research. In doing so, the SERC will:

- 1.Transform SE practice throughout the DoD and IC communities by creating innovative methods, processes, and tools that address critical challenges to meeting mission outcomes (*what*),
- 2.Catalyze community growth among SE researchers by enabling collaboration among many SE research organizations (*who*),
- 3.Accelerate SE competency development through rapid transfer of its research to educators and practitioners (*how*).



Stevens Institute hosts the SERC at Stevens' Hoboken, NJ and Washington, DC campuses. A fundamental tenet of the SERC is its virtual nature – each collaborator is a nexus of research activities. All research projects are staffed by the best available researchers and graduate students from across the collaboration.

Ability to conduct long-term, comprehensive SE research focused on DoD acquisition, including

- Enable integrated development and management
- New ways to link requirements to design
- Leverage modeling and simulation
- Link technical baselines to architectures
- Apply SE to acquisition of services

Ability to leverage developments in systems architecting, complex systems theory, systems thinking, systems science, knowledge management and SwE to perform research to advance the design and development of complex systems across all DoD domains, including

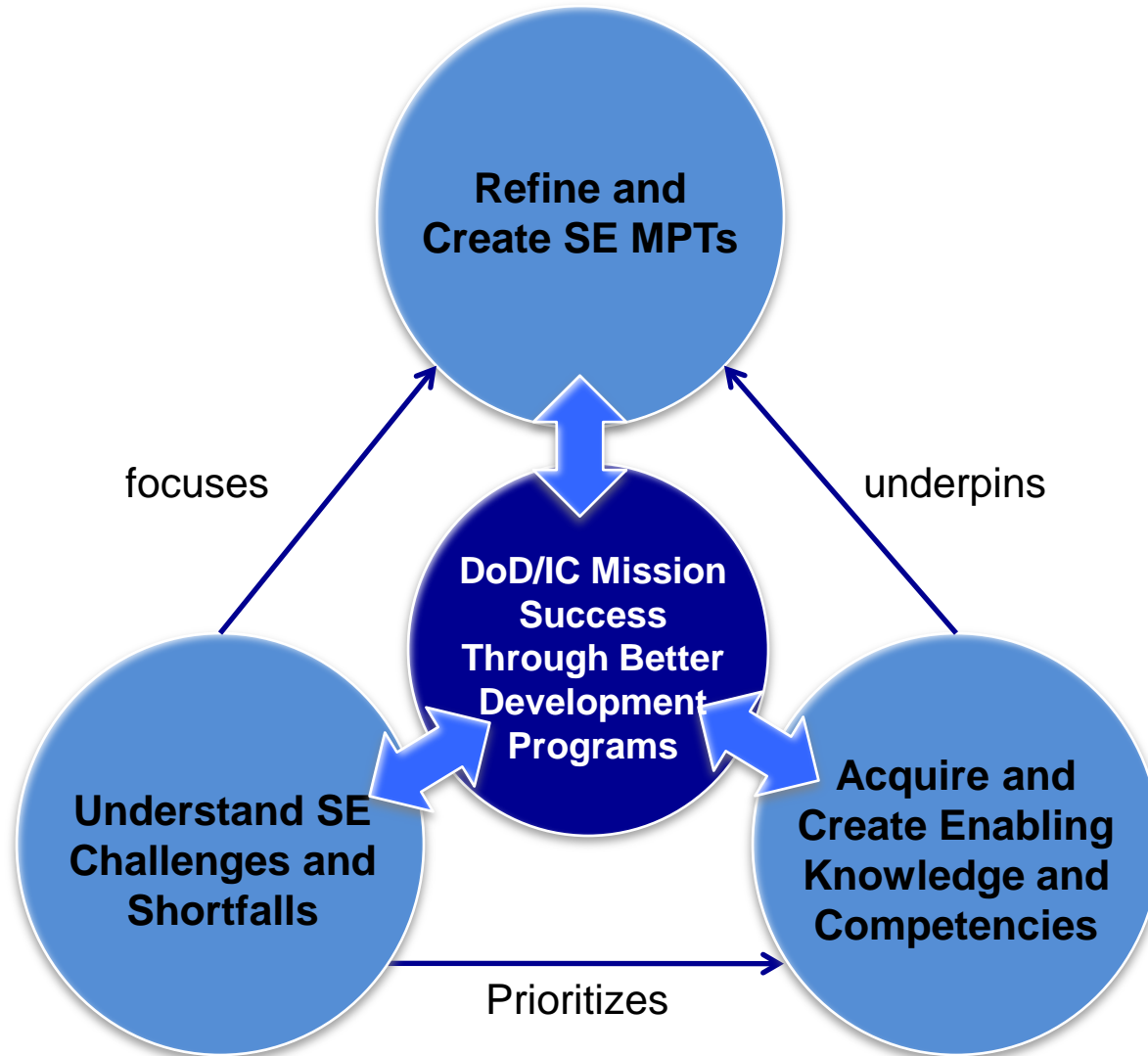
- System and open systems architecture/analysis
- SE in complex SoS and FoS environments
- Enterprise SE
- SW-unique extensions and modern SW-development technology
- Flexible SE environment
- Knowledge management
- Undergraduate/Graduate SE education needs

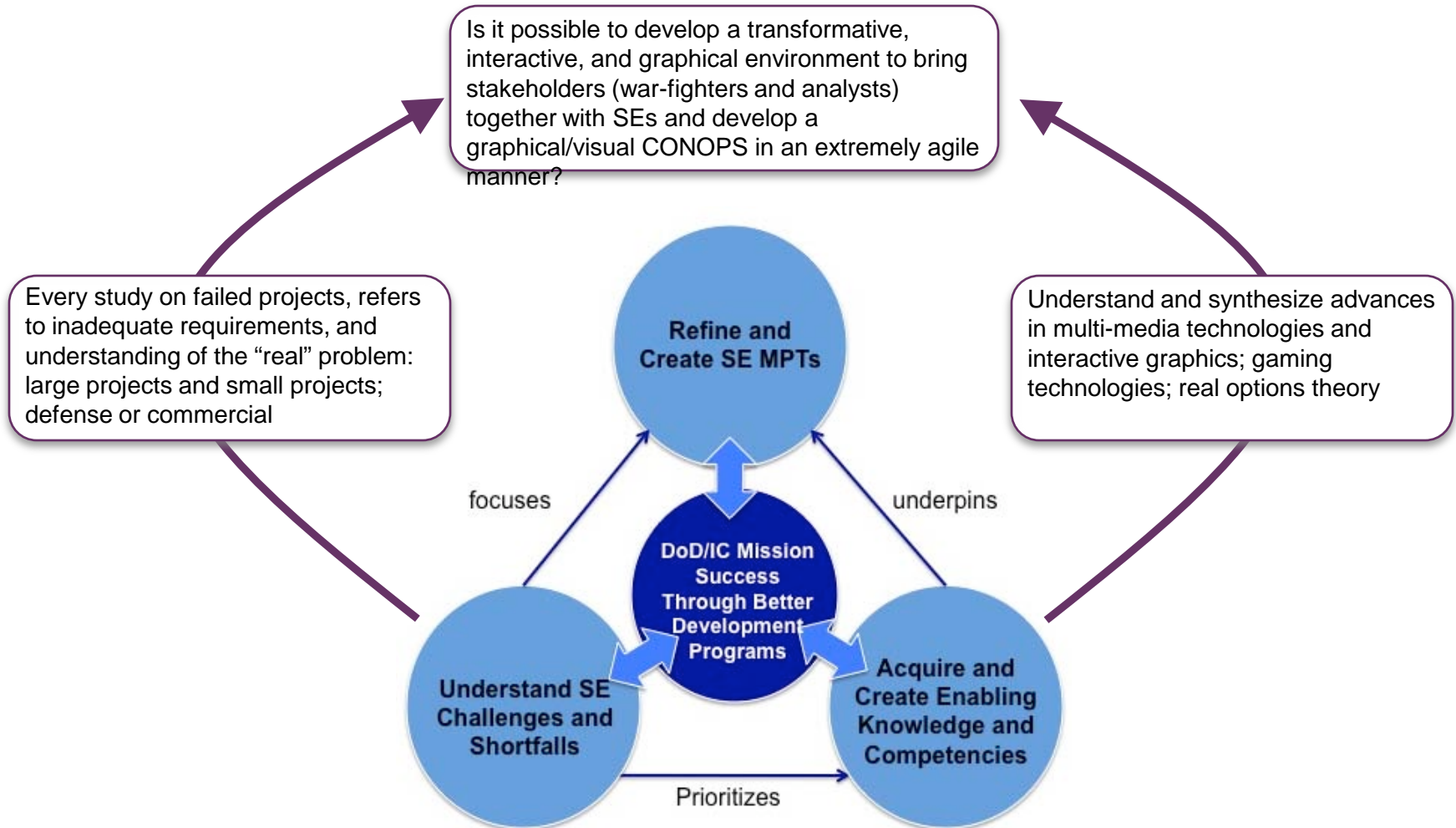
Ability to leverage developments in open systems standards, organizational theory, program management, SE management, and IT to provide needed integration of program/technical management MPTs, including

- Integrate TPMs with EVM
- Maturity reviews
- SE team structures, etc. for improvement
- Improved SE information sharing
- Rationale and way ahead for standards
- Toolsets throughout the life cycle
- Analyzing SE costs, accounts, and ROI
- SE metrics and leading indicators

SERC Research Strategy Areas

1. **Enterprise Responsiveness:** Explore advancements in SE methods, processes, and tools that are responsive to enterprise strategic and program-level needs, enabling agility and responsiveness to change during program conceptualization and execution as well as strategic choice and assessment.
2. **Systems Science and Complexity:** Advance systems science and systems thinking for application to engineering and management of complex systems and capabilities.
3. **Systems Engineering Workforce:** Explore future SE workforce competencies and research approaches to cultivate, educate, and prepare for future SE practices and technologies.
4. **Program Management and SE Integration:** Research the alignment, promotion and integration of SE methods, processes, and tools with program execution activities.
5. **Life Cycle Systems Engineering Processes:** Advance systems engineering life cycle technical and management processes.



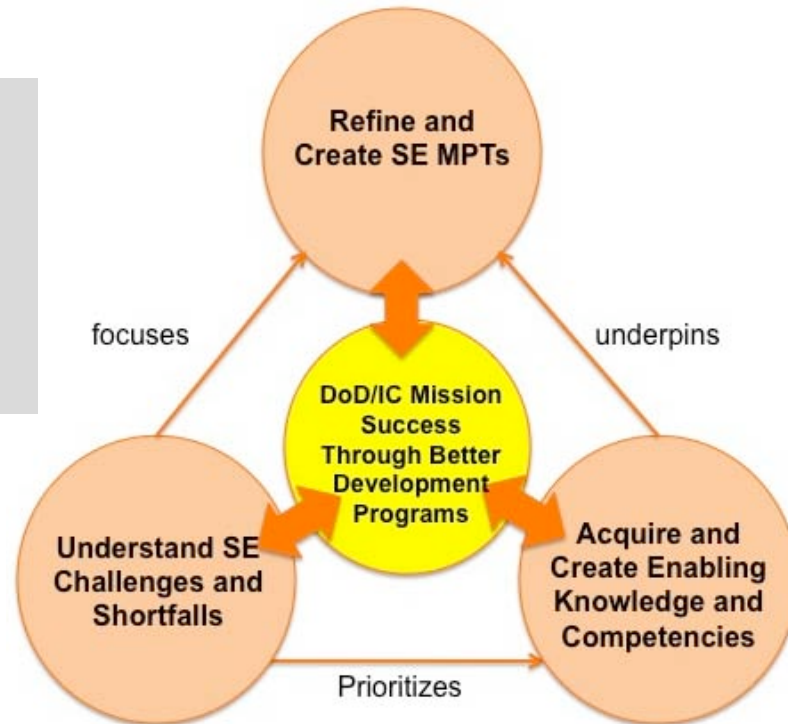


Example: Create SE Body of Knowledge and Graduate SE Reference Curriculum

Support the development of an SE BoK and reference curriculum with professional societies and the broad international community

There is no mature well-recognized SE BoK or reference curriculum, inhibiting the ability to create strong SE competency models and university programs

Understand educational models, learning techniques, and the fundamental knowledge of the SE field that can be codified into a BoK



SE Workforce thrust articulates on which MPTs to focus to address SE challenges and shortfalls



1. Establish a small lead team to craft a series of white papers more fully characterizing a major research area.
2. Gradually draw in additional team members to mature the white papers.
3. Hold an invitation-only workshop of 30-50 people from across the SERC collaborators, sponsors, potential sponsors and adopters, and key technologists to validate the white papers and craft a *research roadmap* that will spawn multiple coordinated Research Topics.
4. Publish results of workshop as polished professionally edited SERC report.
5. Execute roadmap, revisiting it periodically.
6. Selected example of this approach has just begun executing - SE Transformation and System Security