Carnegie Mellon University
Software Engineering Institute

Modernizing Government Software Systems

GOVERNMENT PROGRAMS INCREASINGLY DEPEND ON SOFTWARE SYSTEMS to fulfill their missions. Many of the systems on which government programs place greatest reliance are legacy systems, some decades old. Evolving or modernizing these systems poses significant technical and organizational challenges that too often result in expensive failures.

> *"The federal government spent about 75% of the total amount budgeted for information technology (IT) for fiscal year 2015 on operations and maintenance (O&M)..."*
>
> — Government Accounting Office report GAO-16-468

Benefits of modernizing include

- reduced O&M costs, enabling a shift in available funding for needed projects
- improved time to deploy new or modified functionality
- fewer cyber vulnerabilities
- improved user experience and productivity through better mobile-device support and data access
- ability to achieve stated agency technical directions, including cloud migration

Despite clear benefits, modernization efforts are fraught with technical and organizational risks. For example, understanding the implications of proposed changes is often complicated by eroded organizational knowledge and understanding of systems due to staffing changes, absence of usable documentation, and other factors. A disciplined, evidence-based approach is the best way to manage risk and improve results.

To minimize execution risks for software system modernization projects, leaders in government agencies must not underestimate the difficulty and complexity of coordinating technical, workforce, and organizational changes.

About the SEI's Modernization Approach

The SEI's modernization approach incorporates many of our proven technologies, solutions, and experience from 30 years of helping government and industry organizations with their software systems. Our approach directs organizations through a structured set of activities designed to incrementally modernize software systems. This approach aligns business and mission goals with activities that are realistic and achievable given organizational context (e.g., existing assets, staff capabilities, and infrastructure targets). We help organizations achieve their modernization goals in a measured, incremental manner.

The SEI's modernization approach includes

- **synthesizing clear modernization goals** across mission, organizational, and technical dimensions. These goals will inform subsequent decisions and form the basis for an evidence-based approach to track progress and success.
- **capturing enough of the "as is"** state of the system (the technical baseline), its context (e.g., regulatory and organizational constraints), and organizational capabilities (e.g., experience with candidate technologies and governance structures) to define a practical path forward.

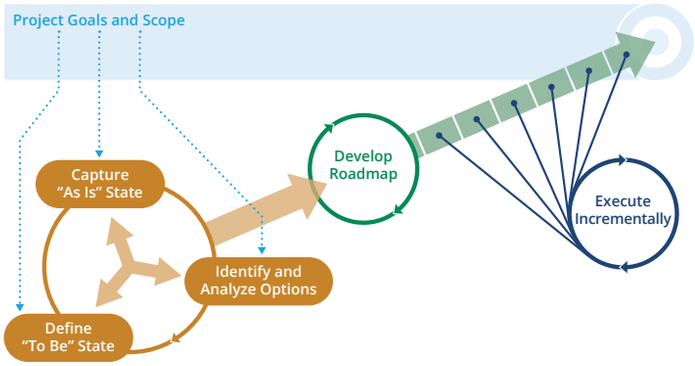
- **identifying and analyzing options** for transitioning to the "to be" state, and identifying dependencies among options as well as dependencies on external factors (teams, projects, or timelines).
- **defining a "to be"** state that includes a future architecture and any changes to business processes, governance structure, and workforce capabilities that are needed to satisfy modernization goals.
- **developing an effective roadmap** to execute the appropriate options based on analysis above. The roadmap will align good technical and architectural choices with effective workforce development, best practices, and organizational support to mitigate risks associated with significant change.

The approach is tailored to organizational and project needs. The SEI can also provide a wide range of support during execution of the roadmap, including agile acquisition strategies, cybersecurity analysis, independent reviews, establishment of effective governance structures, and workforce development.

> *"Our O&M spend is 80% of our budget. We can't succeed that way. We need to move to a 50-50 split between new development and O&M."*
>
> — Federal Agency CIO

Working with the SEI

The SEI is a Federally Funded Research and Development Center dedicated exclusively to software engineering and cybersecurity research and practices. Our role is to guide organizations through difficult and risky decisions, helping to avoid costly mistakes while building expertise for future projects.



The benefits of working with the SEI include

- wide-ranging experience with complex government systems in a variety of domains
- analysis techniques to help glean and understand important desired direction and needs
- independence and impartiality—we are here to serve the government
- technical expertise in a wide range of software engineering and cybersecurity topics such as software architecture, cost estimation, assurance, vulnerability avoidance, and developing balanced roadmaps
- ability to leverage the latest research from the SEI and Carnegie Mellon University

We have helped many government organizations to successfully implement their legacy modernization projects. Let us help your organization achieve your goals.

About the SEI

The Software Engineering Institute is a federally funded research and development center (FFRDC) that works with defense and government organizations, industry, and academia to advance the state of the art in software engineering and cybersecurity to benefit the public interest. Part of Carnegie Mellon University, the SEI is a national resource in pioneering emerging technologies, cybersecurity, software acquisition, and software lifecycle assurance.

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