

## **Thesis Project Portfolio**

### **Language Interoperability: Improving Multi-Language Systems with Bindings**

(Technical Report)

### **Challenges in Accelerating Technological Modernization in Government Agencies: Addressing Barriers to Updating Legacy Systems**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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## **Table of Contents**

Sociotechnical Synthesis

Language Interoperability: Improving Multi-Language Systems with Bindings

Challenges in Accelerating Technological Modernization in Government Agencies: Addressing Barriers to Updating Legacy Systems

Prospectus

## **Sociotechnical Synthesis**

My capstone research investigated how to bridge the gap within large software systems that utilize a number of different programming languages. As technology stacks grow more advanced over time, the interactions between different components of a piece of software also grow more complex. My capstone investigated a few different methods of interoperability - mechanisms by which software written in different languages can communicate with each other - and when one might be more appropriate than the other. Software drives almost everything in the modern day - health, weaponry, flight, financial institutions, and more. Thus, learning how to potentially optimize these large-scale software systems is beneficial to a vast audience, but must be treated with care as so many individuals are involved.

The STS research has identified the barriers, both socially and policy-driven, that hinder technological modernization within the federal government. After identifying these barriers, it revealed the underlying cause of said barriers, and how to address them. My research found that institutional inertia, risk aversion, strict compliance guidelines, and heavy procedural burdens imposed by policy are among the largest sources contributing to the slow rate of modernization. These findings were gleaned from analysis of existing interviews with IT professionals, and rigorous policy review. Two STS frameworks that helped inform my research are path dependency (early choices create long-lasting dependencies) and technological momentum (technology shapes society as much as society shapes it).

My capstone work serves as a diminutive example of a potential way in which the federal government can begin considering how to modernize their aging legacy systems. When

considering both my thesis and capstone research in concert, it provides a broader perspective regarding the issue of modernization, how to start addressing it, and potential solutions.