

Thesis Project Portfolio

Little Ivy Creek Bridge Replacement Using Accelerated Bridge Construction Methods
(Technical Report)

Identity Crisis: The Disconnect Between Transformational Leadership and Engineering Leadership
(STS Research Paper)

An Undergraduate Thesis

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Leadership and Accelerated Bridge Construction Project Management

The United States' aging bridge infrastructure is in desperate need of replacement or rehabilitation. Accelerated Bridge Construction (ABC) methods have been developed to help minimize disruption to the travelling public, a typical consequence of conventional methods. ABC methods truly excel when combined with strong, quality project leadership. My technical project produced a bridge replacement design using ABC methods. My role on this project was as project manager. My STS research focused on the disconnect between engineering leadership and traditional transformational leadership models, and informed my role as project manager for my technical project.

My technical project produced a conceptual design and construction plan for the replacement of Little Ivy Creek Bridge, originally built in 1932 and in poor condition. Stakeholders in the project requested construction time be as short as possible to minimize the cost of traffic impacts, preferably two weeks. A conceptual design for a two twin-cell, precast box culvert replacement for the existing bridge using ABC methods was developed using load and resistance factor design methodology. Analysis of the foundational soils determined they could support the dead and live loading of the box culvert design within typical safety factors. A constructability review of the design addressed the importance of clear prior planning in regards to maintenance of traffic, environmental permitting, and crane stability during construction. Using this design, it is expected that construction could be completed within two weeks. A preliminary cost estimate approximated the project cost at \$510,000, within budget for a project of this size.

Engineering projects require strong project leadership to be successful. My STS research focused on the disconnect between the popular transformational leadership model and engineering leadership as defined by engineers themselves. I discovered that transformational leadership neglects the important engineering leadership themes of personal effectiveness and engineering competency. Furthermore, transformational leadership's focus on a singular, charismatic individual at the top of a hierarchy is largely incompatible with the engineering identity. As a result of these two disconnects, I argue that using the transformational leadership model in engineering leadership education will deter engineers from taking leadership roles.

Exploring transformational and engineering leadership while simultaneously acting in a project leadership role was invaluable. My work in both projects showed that engineering ethics only increase in importance for engineers in leadership roles. Discoveries in my STS research influenced my actions as a project manager. Similarly, my role as project manager for an engineering team helped me see the themes of engineering leadership and the values of the engineering identity in real-world examples.

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