



Ph.D. DISSERTATION DEFENSE

Candidate: Samuel Powell Russell
Degree: Doctor of Philosophy
School/Department: School of Systems and Enterprises / Systems Engineering
Date: Friday, May 3rd, 2024
Time/Location: 10:00 a.m. ET / <https://stevens.zoom.us/j/96941222597>
Title Patterns, Pattern Library, and the Epistemology of Technical Knowledge: Unveiling Tacit Knowledge through Architectural Theory

Co-Chairperson: Dr. Jose Ramirez-Marquez, School of Systems and Enterprises, SIT
Co-Chairperson: Dr. Dinesh Verma, School of Systems and Enterprises, SIT / SERC

Committee Members: Dr. Mo Mansouri, School of Systems and Enterprises, SIT
Dr. Brian Sauser, College of Business, UNT

ABSTRACT

Experiential knowledge is the domain of the technical expert. Derived from experience, experiential or tacit knowledge differs from a priori knowledge learned through reading or specification. Difficult to ascertain or describe, expert knowledge is the domain of knowledge management systems and the subject of this research.

The systems engineering domain has been held accountable for a lack of elegance in system design. Resolving this criticism requires reducing the cognitive load of the performing architect, often in cases with little historical precedence. Although technology may differ, architectural historians argue that truly novel systems do not exist, as modern systems evolve from the debate surrounding older systems. If this perspective holds, a technique for harvesting expert knowledge from proven systems and packaging it in a reusable and archivable format could help reduce development risk, enable creativity and innovation, and address the criticism of inelegant design.

This research introduces a framework for expressing expert knowledge derived from proven systems. Utilizing the architectural theory of patterns and pattern mining techniques, the framework articulates expert knowledge gained during the sequential development of a novel solution to a problem plaguing transportation grid electrification. Described using Systems Engineering techniques, the holistic expression of technical knowledge is intended for archival in a library of patterns. Such a library will serve as a cornerstone for advancing system design practices within the systems engineering domain, empowering practitioners to streamline processes, innovate with confidence, and drive transformative change through the strategic implementation of digital engineering methodologies.