Thesis Portfolio

Enterprise Resilience of Maritime Container Ports to Pandemic and Other Emergent Conditions

(Technical Report)

An Exploratory Analysis of the Phylloxera Crisis of the 1800's and the Implications on the Current Virginia Wine Industry

(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

Simone E. Olson
Spring, 2020

Department of Systems and Information Engineering

Table of Contents

Sociotechnical Synthesis

The Port of Virginia (PoV) generates 530,000 jobs, or one of every nine jobs across Virginia, and has an overall annual economic impact of $88.4 billion. The PoV has partnered with a University of Virginia Capstone team to explore emergent and future conditions that influence the world container port industry which include regulations, emerging markets, technologies, environments, workforces, supply chain partners, and others. One emerging industry within Virginia, is the growing number of wineries. Understanding how the Virginia wine industry evolved is critical to discover where the wine industry is headed. Specifically, it is important to explore how Virginia was able to grow European grapes by exploring the impact of a bug called phylloxera on vineyards around the world.

The report "Enterprise Resilience and Sustainability for Operations of Maritime Container Ports" describes an identification of the most and least disruptive scenarios of emergent and future conditions that will influence the Port of Virginia. The degree of disruption is measured by the changes in priorities of a port's strategic plan, in particular for the rank order of investments by their individual contributions to the strategic goals of the port. Specifically, the report analyzes eleven strategic goals, 157 strategic plan investments, several dozen emergent and future conditions. The analysis assembles the emergent conditions into five or six scenarios at a time. The most disruptive scenarios are selected for contingency planning, enterprise risk management, and corporate research & development and presented to the Port of Virginia. The most disruptive scenario was a scenario 4, Pandemic, and the least disruptive scenario was scenario 6, Alternative Financing.

Virginia has had a long history of trying to grow grapes, from the early British colonies, to Thomas Jefferson, all attempts resulting in failure. The problem was that American grape

varieties have a bitter taste, and the wine produced from them is subpar in comparison to wine produced by European grapes. However, when European grapes are grown in Virginia they are destroyed within two to three years by a bug called phylloxera that feeds on the structural roots of the European grapevines. The research paper "An Exploratory Analysis of the Phylloxera Crisis of the 1800's and the Implication of the Current Virginia Wine Industry" explores the connections between phylloxera, and the scientist, Charles V. Riley, that identified and studied the lifecycle of phylloxera. The paper uses Actor Network Theory to answer the research question: "How did scientific analysis play a role in solving the phylloxera infestation of the wine industry during the mid 1800's and what is it's lasting effect on the Virginia Wine industry?" The paper found that Charles V. Riley, an entomologist, played a vital role by identifying phylloxera in French and American vineyards, studying phylloxera's lifecycle and relationship to different grapevine varieties. He was also able to propose a solution, grafting the European grapevine to the resistant American grapevine to fight the infestation. Riley's lasting research on grafting and phylloxera enabled the Virginia wine industry to grow and produce high quality wine.

Conducting the two research projects together gave insight on how quickly the economies and lives can change. The phylloxera crisis quickly devastated the wine industry, and had a lasting effect on not only the French economy but also Virginia's. This is an important lesson for the Port of Virginia as they rely on multiple industries for business, but if an unexpected event happens they have to know which initiatives are resilient. Understanding the phylloxera infestation, and the effect on Virginia helped with understanding the scope of similar possible future and emergent conditions the will affect the Port of Virginia. In conclusion it was helpful to have conducted both research projects simultaneously.