

Plant-Scale Manufacturing Method for Covaxin, a Novel Inactivated COVID-19 Vaccine
(Technical Report)

An analysis of the true root cause behind the Texas City Refinery explosion using Actor-
Network Theory
(STS Report)

An Undergraduate Thesis Portfolio
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By

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Sociotechnical Synthesis

The relationship between my STS and technical projects is not clear upon initial consideration, although with deeper analysis, I found that they are profoundly interconnected. My technical project consists of the design of an industrial scale manufacturing plant for the production of a COVID-19 vaccine, while my STS project consisted of a root cause analysis of the 2005 Texas City Refinery Explosion. Both projects are made necessary due to the threat of risk in our lives. Root cause analyses of process safety incidents are developed so that we may mitigate the inherent risks of chemical processing and live safe lives in this industry. Likewise, the COVID-19 vaccine is produced to mitigate the inherent risks of the deadly virus. I believe that understanding the sources of risk in your life is necessary to take the measures critical to prevent undue suffering to yourself and your community. In what follows, I further elaborate on the projects I completed for my thesis.

My technical project scales up the production process of a vaccine to accommodate global demand to eventually end the Sars-CoV-2 pandemic. We designed the full process needed to go from a frozen host cell stock to a fully formulated vaccine product, ready for global distribution. The final product is a 5mL vial of COVID-19 vaccine (contains 10 doses). The scope of our project aims to produce roughly 713 million doses annually. Without considering the science, technology, and society aspects of this technological fix, I originally believed that the production of this COVID-19 vaccine would be sufficient to make significant strides towards the end of this pandemic. I now realize that it is insufficient to create a COVID-19 vaccine without educating the masses on the benefits of getting vaccinated. My STS research paper revealed that we are inherently unlikely to engage in behaviors that are new to us. People must

understand the risks involved in avoiding vaccination, otherwise we will never overcome this pandemic.

My STS research paper involves pure research to gain an understanding on how the Texas City Refinery became the location of the worst workplace incident that this country has ever seen. Using the framework of Actor Network Theory (ANT) by Michel Callon, I deconstructed the actor network present at the refinery and traced its demise. I found that this incident happened because of the rogue actor of “cognitive inertia”. This rogue actor explains why humans tend to reject changes to their behavior because they are comfortable in their current beliefs. Although the refinery had many warning signs that an explosion was on the horizon, they took no actions to change their behaviors and prevent the incident. Through considering both these projects simultaneously, I have gained a more comprehensive understanding on how technology deeply reflects and builds the social structure of the world in which it exists. I learned that even when faced with inherent risk, people may tend not to adopt technology that can prevent the loss of life such as in the case of the Texas City Refinery. This may also be extended to my technical project; it is expected that 28.5% of people will not get the COVID-19 vaccine despite the benefits of this immunization tool. In the future, we must delve deeper into how we may overcome cognitive inertia to avoid preventable losses of life.

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