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Socio-Technical Synthesis

My technical and Science, Technology, and Society (STS) research are connected primarily in ensuring user safety. User safety assures that engineered technologies provide acceptable safety levels for humans and is central to my technical project and my research paper. However, the two works differ in the way they explore user safety. My technical project focuses on designing and building a device that combats and stops the spread of Coronavirus (COVID-19) particles from transmitting from human to human. In comparison, my research explores what happens when user safety is not a priority for a device that can save human lives and who can be held responsible. So, while my technical project and my STS research address user safety through various methods, the central theme of user safety in the design process for any field of engineering is carried across both projects. In what follows, I briefly summarize both the technical and STS research, along with what I learned from working on both projects simultaneously.

My technical project explores the idea of user safety by building and optimizing a wearable air purification system that overcame the limitations of current masks (e.g. tiring, hot and foggy glasses). My capstone team fabricated an apparatus with 3D print parts, HEPA filters, and other widely available components from online sites to create an affordable cost and lightweight device. Compared to the vast majority of face masks being utilized, such as cloth, surgical, or N95 masks, our wearable filtration apparatus increases user safety by providing superior filtration and comfortability. My team's approach allows for complete face protection with a protective air volume in front of the user's face free of virus particles. We tested our

apparatus to ensure it supplies sufficient airflow and filtration that met the National Institute for Occupational Safety and Health (NIOSH) requirements for such a device. Overall, our apparatus has established a new and novel way to overcome the current limitation while providing comfort and protection for users from COVID-19 particles.

My STS research paper examined a different approach by looking at how a network can fail because engineers/organizations did not prioritize user safety when developing and manufacturing their devices. This oversite led to humans being severe injuries and, in some cases, lead to death. I used the Actor-Network Theory (ANT) to examine the network of Takata airbags and their goal of manufacturing airbags for vehicles. However, they would explode, causing metal shrapnel to be thrown at passengers. I discussed why not only the technical actors contributed, but also the human actors that assisted in the networking, failing and putting humans in harm. The goal of my research paper is to provide a new understanding and evidence as to why certain technologies fail due to actors involved in the network.

I have learned a great deal of knowledge by working on both projects (technical and STS) simultaneously instead of independently. My technical work gave me a better understanding of the medical device engineering process, which relies heavily on user safety. This knowledge helped me provide accurate context and background for the actors' decision thinking involved in my research paper. In addition, the research I conducted for my STS paper helped me see how vital user safety is to technological designing and the negative consequence associated with that parameter. This new knowledge encourages me to create great technological devices and strive for good engineering practices. Overall, working on both projects at the same time has guided my thought process to solves problems. It has also helped design a physical apparatus that users will enjoy wearing in an effort to lower COVID-19 cases.