Thesis Portfolio

A User Interface Informing Medical Staff on Continuous Indoor Environmental Quality to Support Patient Care and Airborne Disease Mitigation

(Technical Report)

Running Technology Advancement and Competition Regulations

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The Capstone project and the STS projects described in the paper, although mostly unrelated, can be connected under the general idea of human health and well-being. The Capstone project deals with the issue of Indoor Environmental Quality (IEQ), specifically in the context of hospitals, and how different IEQ factors can impact human health as well as how it can impact COVID-19 airborne exposure risk. The STS project topic was chosen out of the author's personal interest and focuses on disruptive running shoe technology. The research will target the Nike Vaporfly and how the response of sports governing bodies can impact the running community in beneficial as well as harmful ways.

The Technical Report deals with the issue of IEQ within the UVA Hospital in the context of the COVID-19 pandemic. Awareness has grown around the capability for COVID-19 to spread through aerosols which is especially relevant for indoor spaces such as hospitals, where individuals are often in close proximity to each other and air flow is limited. With growing attention towards indoor air quality and overall IEQ, it is important to consider how various IEQ factors can impact human health and what can be done to maximize the quality of an indoor space. The Capstone team plans to address the issue of IEQ by designing a UI system that can provide information about different IEQ factors in various rooms throughout the UVA Hospital. The interface would be able to inform healthcare workers about IEQ factor levels within a space and would consequently allow them to take necessary action to maximize overall patient well-being.

The STS research focuses on the relatively new development of the Nike Vaporfly shoe which was recently used by runners to break world records in various racing events. The shoe's claimed ability to improve running economy by 4% prompted questions of fairness and

ultimately led to new regulations set by World Athletics, the governing body of running. Understanding how governing bodies have responded to past and present innovative sports technology in the context of their times through the use of the STS framework Technological Momentum provides better insight into the case of the Nike Vaporfly. By analyzing the regulatory responses of governing bodies in regards to new sports technology, further insight is gained into the main research question: how should governing bodies respond to disruptive sports technology in a manner that promotes fairness yet does not hinder athlete achievement?

The completion of these projects provided interesting insights. The technical topic revealed an overall lack of significant existing literature on a holistic approach to IEQ, showing a need to address this topic on a larger scale. Through the design of the UI system, it was interesting to learn the needs of healthcare workers and to design for those needs. The process revealed to me that in order to design an effective product, there is a need for continual workshopping of design iterations with the products' intended users. The STS research revealed the complexity of sports regulations and how multiple perspectives must be considered to create an informed decision. Regulations are often a result of compromise between various stakeholders' perspectives and sometimes can be a result of hasty decisions. Therefore, it is important to question regulations at times and to advocate for change when necessary so that a fair yet competitive environment can be created.