Thesis Project Portfolio

Safe and Sustainable Fleet Management with Data Analytics and Training
(Technical Report)

Strategies for Effective Implementations of Vehicle Driver Performance Tracking Technologies in the Workplace
(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
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Bachelor of Science, School of Engineering

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Sociotechnical Synthesis
(Executive Summary)

Investigating Strategies for Implementing Vehicle Tracking Technologies in the Workplace

The transportation industry is among the largest contributors to global carbon emissions. Additionally, commercial vehicle fleets have numerous opportunities for safety improvements, many of which are measurable in human lives. These two factors: sustainability and safety within vehicle fleets served as the motivation for both my technical project and STS research. For the technical project, my team and I partnered with The University of Virginia Facilities Management (UVA FM) to apply our research to their fleet of vehicles and drivers. My STS research drew heavily upon my experiences with our technical project, enacting a solution to a real-world problem, and analyzing its effects.

In the technical portion of my thesis, our team produced an agency-specific, data-driven mindful driving training program. In recent years, UVA FM has installed telematic tracking devices on vehicles fleetwide which constantly record a wide range of driving performance data. Based on an evaluation of prior research, analysis of historical UVA FM data, and numerous discussions with industry experts, our team identified six metrics which we believed to be largely influential in measuring the safety and sustainability of driver behavior. Those metrics were hard acceleration, hard braking, hard cornering, speeding, seat belt usage, and idling time. All metrics but idling time, which was measured in minutes, were measured as incident counts by vehicle for a given timeframe. The decision to deliver a training program as our final product was in large part due to FM's desire for a truly personalized application of their telematic data. Our research revealed that such an approach had yet to be attempted on a similar scale, if at all. Most training-based applications we reviewed were generic and failed to address the unique aspects of any given fleet. In order to assess the efficacy of our final training program, it was implemented

on a pilot group of FM drivers. Preliminary statistical analysis revealed that our program led to a significant reduction in incident counts for all metrics except hard cornering. While these results are largely promising, we did not design the program to end after a single implementation. Our team expects FM to continue to iterate over and improve our training for future, more expansive use across the fleet.

My technical project team's partnership with UVA FM afforded us the unique opportunity to incorporate the drivers we'd be training in the development of the program. This allowed us to identify effective strategies for implementing a data-driven training program in general, but more importantly, how to do so specifically for the UVA FM fleet. Before development of the training began, our team conducted a focus group with a selection of drivers to gauge their commitment to improving their driving behavior and their preferred methods of learning. Additionally, throughout the development process, we consulted with a training facilitator expert who helped guide us through the creation of a training program from scratch. My STS research was primarily focused on effective strategies for implementing data-driven initiatives in the workforce, especially those that attempt to alter employee behavior. The development and implementation of our training program is how I obtained many of the conclusions addressed in my research paper. Throughout our meetings with FM drivers, leadership, and industry experts, I identified three key elements of effective implementations. Those features were, the inclusion of drivers in the development of tools which utilize their data, transparency between management and drivers, and sufficient motivation or "buy-in" by both drivers and management.

My STS research investigated how best to implement tracking technologies within the workforce, and my technical project enacted those strategies, and analyzed their results. The

human-focused nature of each aspect of my thesis emphasized many of the ethical discussions had in STS 4600. As engineers, the implications of our work on humanity aren't always clear because it can be difficult to remove ourselves from analysis and optimization and account for societal effects. Yet in order to be truly ethical we must do so. Our team's desire to pursue a personalized approach in a way forced us to examine these effects. The frequent contact we had with drivers and management helped balance the importance placed on results of the training and the ethical nature of our work and my research.