

Thesis Project Portfolio

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

The Social Construction of Electric Vehicles in Work Fleets
(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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The projects included in this Thesis Portfolio both contain research regarding fleet vehicles. The Technical Report describes how data analytics were used in order to create relevant training resources for the University of Virginia Facilities Management fleet, in order to improve both safety and sustainability. Proactive and reactive training methodologies were tested, with the former occurring before any violations of safety or sustainability occurred, and the latter addressing specific violations the week after they occurred. Statistical tests were used to determine which of the two training programs were more effective. The STS Research Paper aims to further explore fleet sustainability by using the social construction of technology in order to determine if work force fleet's desire for electric vehicles is socially constructed. Using this framework, both corporate and government fleets are explored, with research conducted on specific instances of electric vehicles being incorporated into these organizations.

The University of Virginia's Facilities Management (FM) Fleet consists of around 260 total vehicles, and is committed to safe and sustainable driving. These vehicles contain telematic tracking systems which provide feedback on a multitude of driving behavioral measures, including speeding, harsh braking, hard acceleration, seatbelt usage, harsh cornering, and idling time. Last year, data collected on these measures was used to develop relevant educational materials on mindful driving. Our capstone project team aimed to further improve safe and eco-friendly FM driving behaviors by analyzing if reinforcement training (additional scorecards and manager conversations) proved to be effective when given proactively or reactively to increased violations of driving behavioral measures. The technical report outlines the process we used in determining when and how to administer the proactive training program. A separate group of shops received the reactive training after any significant increase in driver incidents was

detected. These reinforcement training programs were largely based on the professional FM driver education modules and provided conversation templates for managers to use in order to re-educate their shop's respective drivers.

Electric vehicles (EVs) are rapidly gaining popularity among corporate and governmental fleets across the world. Many fleets are replacing traditional internal-combustion engine vehicles (ICEVs) with electric delivery and work vehicles. However, electric vehicles do not yet compare to traditional cars in terms of mileage, infrastructure, and general reliability. As electric vehicles do not emit greenhouse gases, they are more resource-efficient than ICEVs. They are a crucial step in making transportation more eco-friendly, so analyzing the root of their demand is extremely important in looking at the future of their relevance. This research paper uses the social construction of technology (SCOT) framework to analyze the increased fleet interest in EVs in order to answer the research question: can the increased interest in electric vehicles among work fleets, both corporate and governmental be attributed to socially constructed desires? Exploring this question will ultimately prove beneficial when discussing the future of vehicle-manufacturing, as electric vehicles become more commonplace.

Completing both of these projects simultaneously was valuable, as working closely with the University of Virginia's Facilities Management allowed me to understand the inner workings of a vehicle fleet while writing about larger and more complex fleets. I was able to understand the logistics of an organization incorporating electric vehicles into their fleet, as the university begins to add their own EVs. Focusing on aspects of sustainability in the STS Research Paper made me further appreciate the value of the Capstone Project, in which we aimed to reduce environmental infractions through training programs.