

Thesis Portfolio

Safe and Sustainable Fleet Management with Data Analytics and Training

(Technical Report)

A Human-Centered Approach to Sustainability: Empowering Behavioral Change in the Transportation Sector

(STS Research Paper)

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Table of Contents

1. Socio-technical Synthesis
2. Safe and Sustainable Fleet Management with Data Analytics and Training
3. A Human-Centered Approach to Sustainability: Empowering Behavioral Change in the Transportation Sector
4. Prospectus

Socio-technical Synthesis

Recently, fleet management teams have begun to adopt a triple bottom line approach to evaluating the performance of their organization – optimizing costs, while maintaining high compliance to safety standards and concern for environmental impact. Eco-driving is a style of driving which reduces fuel costs, carbon emissions and safety risks. Currently, there is no foundational sustainable and safe driving training provided to the University of Virginia's Facilities Management (UVA FM) drivers. UVA FM fleet managers have installed telematic sensors in all vehicles to collect data on driving behavior, however no analytical infrastructure exists to garner insights. Creating an agency-specific data-driven program for UVA FM which encourages vehicle operators to implement mindful driving habits was the leading goal of research. To create the program, data was analyzed to pinpoint behavioral inefficiencies impacting safety and sustainability and evaluate the effectiveness of the training program administered to FM drivers. Successfully implementing eco-driving styles can be difficult even after being nudged by training due to lack of alignment with personal motivations, inadequate incentives, or inconsistent feedback. For these reasons, deploying vehicle assistance systems and technologies that couple human behavior with environmental impacts are essential for sustained progress. By considering the human and social dimensions of eco-driving programs, fleet management teams and eco-driving researchers can better understand the interactions between human and non-human actors in the fleet driving system when employing eco-driving programs. Actor-network theory was applied to evaluate different approaches to empowering eco-friendly behaviors through the collective effort of vehicle drivers (users), eco-driving assistance systems (behavioral aids) and fleet managers (behavior-enforcing allies). Programs of action and delegation, with respect to the aforementioned actors, were explored within the actor-network theory framework. Through the

sociotechnical research, a case comparison of tiered eco-driving programs studied in journal article trials was conducted to compare relative fuel efficiency changes and identify challenges to and benefits of human-centered programs. Through the technical research, the implementation of the safety and eco-driving training significantly reduced UVA FM driving behavioral inefficiency metric incident counts reflecting that a combination of virtual training backed by agency-specific data-driven insights to be effective. Both the development of the UVA FM training program and the case comparison of hybrid eco-driving programs offer value towards defining quality strategies for lowering carbon emissions within the transportation industry.