Automation, Electrification, and Shared Mobility in Freight

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Project Objective

This study aims to provide an overview of the different technologies of electrification, automation and shared mobility (3Rs) in freight transportation for the long-haul and last mile. The study provides a view of their penetration status and explores the potential, challenges, and unintended consequences of their arrival in the transportation system. An overview is also provided of the required changes and the driving forces needed to foster the 3Rs in freight. The results can help inform the development of the next phases and future steps, plans, and policies or initiatives needed for the next generation of the freight transportation system, especially in urban areas.

Problem Statement

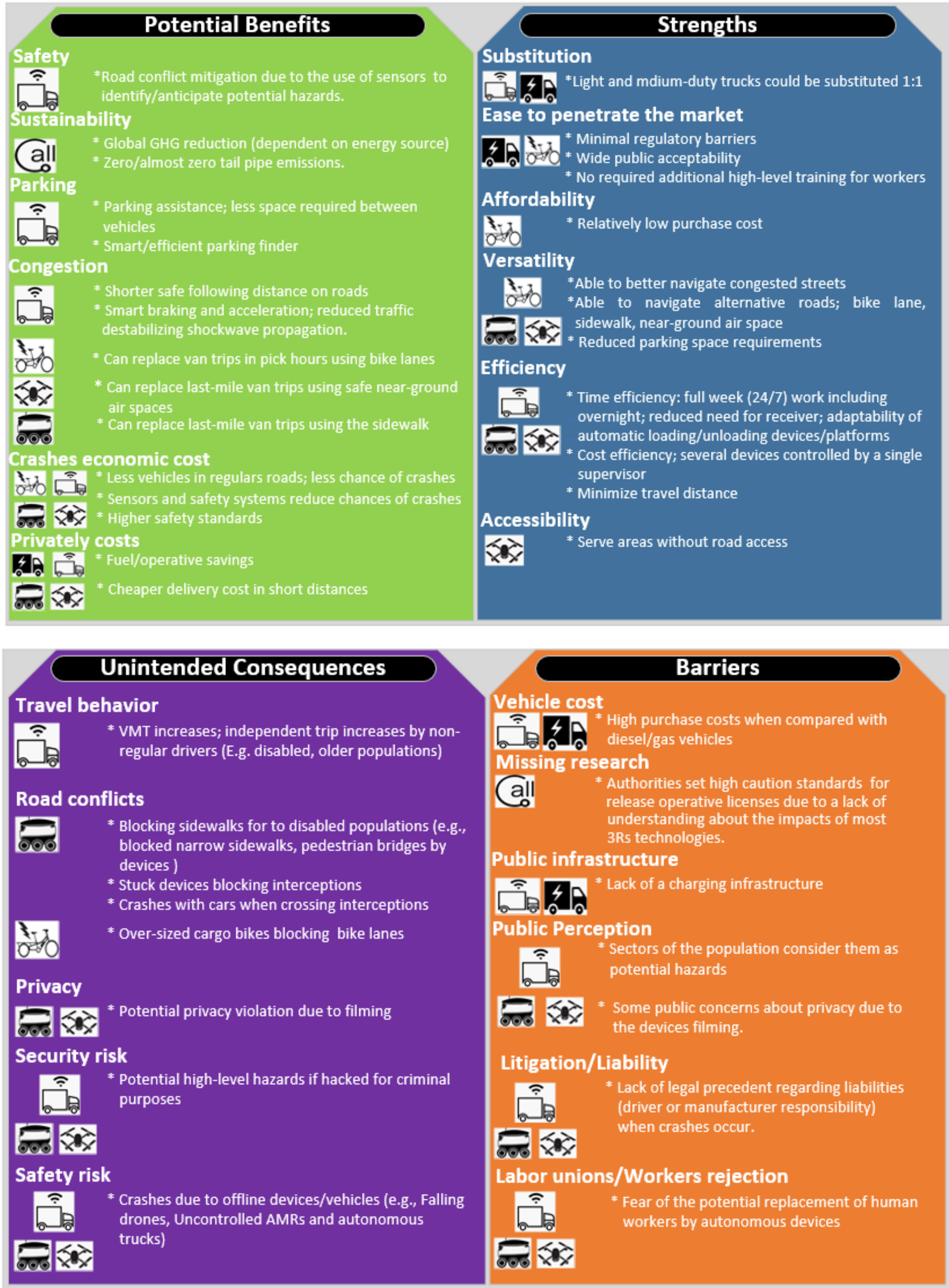
The negative impacts of the disproportionate externalities of transportation, such as pollutant emissions, noise, and congestion, have called into question the sustainability of traditionally used modes and logistics operations. Consequently, in the last few years, several new technologies have been tested; more efficient and less environmentally disruptive, these technologies are being embraced in the so-called transportation third revolution (3Rs): automation, electrification and shared mobility for both passengers and freight. On the passenger side, the 3Rs have already shown significant benefits in cost reductions, noise, and emissions. However, on the freight side, the revolution is still in its infancy, which is the reason behind this study's focus on the status of 3Rs in freight.

The technologies in this revolution have different features; cargo capacities (size, weight), refueling needs, and even differences in infrastructure requirements (e.g., sidewalks, bicycle lanes, and near-ground air space). All of these requirements/changes are a key challenge for the planners and decision-makers that will need to design new policies that guarantee the integrity and safety of all urban system users. It is indisputable that electrification and automation technologies will change freight transportation and will introduce new paradigms, regulations, road rules/laws, potential benefits, and negative impacts. A better understanding of the features of these technologies is necessary for anticipating their unintended consequences, or for reorienting their development. Consequently, it is important to consider such questions as: What is the potential of these technologies?; Which is ready for implementation?; What are their current, and expected, penetration levels?; and What are the changes needed to accommodate these technologies in the freight transportation system?

Research Methodology

The team conducted a multiple-pronged research approach. The first step was a synthesis of the literature to identify the relevant characteristics of the urban transport system. The team focused on two industrial and economic sectors in urban areas: food and retail, considering their participation in the urban freight sector and current initiatives in those areas. Second, the team conducted a comprehensive literature review, including technology developers' commercial information and scientific research/reports to identify the various in process options for the urban delivery revolution. The team described several case studies and performed critical analyses to identify benefits, challenges, and possible unintended consequences associated with the arrival of these new technologies. Finally, the team discussed potential driver factors to foster greater penetration of the 3Rs in freight.

Results



For more information, the reader is referred to the project report "Automation, Electrification, and Shared Mobility in Freight," or contact Miguel Jaller, mjaller@ucdavis.edu.