Center for Advanced Multimodal Mobility Solutions and Education

UTC Project Information – CAMMSE @ UNC Charlotte	
Project Title	Effect of Connected and Autonomous Vehicles on Supply Chain Performance
University	Washington State University
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Funding Sources and Amount Provided (by each agency or organization)	The University of North Carolina at Charlotte: $63,462 Washington State University: $31,738
Total Project Cost	$95,200
Agency ID or Contract Number	
Start and End Dates	10/01/2020 – 09/30/2022
Brief Description of Research Project	Connected and autonomous vehicles (CAVs) are an emerging technology that has great potential for increasing road capacity and reducing traffic incidents, congestion, fuel/energy consumption as well as emission, all of which may support safer and more reliable and efficient (and potentially sustainable) transportation systems. Given that transportation network plays a key role in a supply chain system in terms of its performance and cost, CAVs will ultimately change many aspects of a supply chain system. While the effects of CAVs on transportation network have been extensively studied through simulations or empirical data, only a limited number of studies have been conducted to investigate potential opportunities

	(or challenges) that may arise from the introduction/adoption of CAVs in the context of supply chain design, operation and performance. Moreover, their quantitative effect on a supply chain system has yet to be explored in any depth. The proposed CAMMSE project will propose a model that quantitatively assesses the direct and indirect effects of CAVs on a supply chain system by varying the levels of CAV market penetration and driverless truck adoption. The proposed research will first investigate the effect of CAVs on transportation network and incorporate it into supply chain analysis to evaluate how it would change routing decisions, travel time between echelons, and restrictions on distance a commodity can travel. Moreover, the changes brought about by the adoption of driverless trucks will be quantitatively assessed through the updated input or intermediate variables in supply chain analysis. Finally, the proposed model will be applied to a hypothetical regional supply chain network of fresh food in which the expedited and efficient delivery of product is of vital importance due to product quality degradation over time. Through the illustrative example, the effect of CAVs on supply chain system performance will be quantified in terms of unmet demand ratio (or the amount of qualified products delivered at retailers over a given period of time), total supply chain cost, and total emission. The proposed research will allow supply chain managers (and grocery delivery companies) to better understand how supply

	chain design and operation could be transformed and reoptimized in response to the introduction of CAV technologies. The research outcomes would help them better utilize the opportunities and address possible challenges that may arise as a result of CAVs to maximize their benefits while minimizing related costs.
Describe Implementation of Research Outcomes (or why not implemented) *Place Any Photos Here*	
Impacts/Benefits of Implementation (actual, not anticipated)	
Web Links • *Reports* • *Project website*	https://cammse.uncc.edu/sites/cammse.uncc.edu/files/media/CAMMSE-UNCC-2021-UTC-Project-Information-10-Lee.pdf https://cammse.uncc.edu/sites/cammse.uncc.edu/files/media/CAMMSE-UNCC-2021-UTC-Project-Report-10-Lee-Final.pdf