

UTC Project Information	
Project Title	Measuring User Acceptance of and Willingness-to-pay for CVI Technology
University	Morgan State University
Principal Investigator	Hyeonshic Shin
PI Contact Information	Hyeonshic.Shin@morgan.edu
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Project Cost	\$149,733.00
Start and End Dates	February 1, 2013 – January 31, 2015
Project Duration	2 years
Brief Description of Research Project	<p>The primary goal of this study is to identify elements of successful deployment and diffusion of connected vehicle infrastructure (CVI) that is expected to bring various benefits. After the development of survey questions and online interface in close collaboration with Technical Advisory Board (TAG), three groups of drivers will be surveyed. The three groups are those (1) who drove Connected Vehicles (CVs) as participants in previous and ongoing CVI studies; (2) who have not driven CVs, but receive detailed information on benefits of CVI at the beginning of the survey; and (3) who do not receive detailed information on benefits of CVI at the beginning of the survey. Conjoint analysis will be used to identify preferred bundles of on-board CV technologies; drivers' willingness-to-pay (WTP); the pros and cons of current CVI from survey participants' viewpoints; and suggestions on how to improve the current CVI system. The study findings will provide insights for policy makers, planners, engineers, and automobile and CVI technology companies to understand the preferences of vehicle purchasers.</p> <p>Connected vehicles are equipped with on-board technology to communicate wirelessly with other vehicles (vehicle-to-vehicle, V2V) and roadway equipment (vehicle-to-infrastructure, V2I). Altogether, they are referred to as Connected Vehicle/Infrastructure (CVI). Among many benefits, the potential safety impacts of CVs stand out. Najm et al. (2010) estimates that a full implementation of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) systems together would address 81 percent of all vehicle target crashes that involve unimpaired drivers. Target crashes are vehicle crashes that would potentially be avoided with connected vehicle systems (e.g., crashes involving lane change). In addition, a decrease in potential crashes and vehicle conflict would substantially improve the mobility of people.</p> <p>Despite potential benefits of CVs, there is a lack of study</p>

	<p>efforts to identify drivers' acceptability, preferences, perceptions, and willingness-to-pay (WTP) for the current CVI system. Earlier studies mainly focused on supply-side aspects such as technology identification and definition, technical feasibility, deployment scenarios, infrastructure needs, standards, funding, and designated short-range communication (DSRC) certificate authority (Hill and Garrett 2011, 24-26). While supply-side policies are important concerns of the public sector, the identification of needs of potential users is also an important step for a full implementation of CVI in order to get maximum benefits from this one-time mega-investment. "Connected vehicles will only be successful if accepted, implemented and ultimately used by consumers" (Skinner 2010, 4).</p> <p>User acceptance and WTP should be examined before fully implementing any new technology. One may think that consumers' acceptance may not be a big issue "if the government chooses to mandate this [connected vehicle] program" (Hill and Garrett 2011, 41). However, studies show that government mandates often did little for fast technology diffusion. For example, "even with a federal mandate, the airbag went from effectively zero penetration in 1980 to 100% in 1996" (Hill and Garrett 2011, 41). Moreover, the transition will be undertaken within a heterogeneous vehicle/driver population, and some of these user segments will be less inclined to purchase new cars equipped with connected vehicle technology. A long transition period is likely to be unavoidable. Indeed, a report to the Research and Innovative Technology Administration (RITA) of the U.S. Department of Transportation (USDOT) proposes a progressive deployment of connected vehicle systems over a twenty-year horizon (Hill and Garrett 2011, 41). If drivers' acceptance of and WTP for new technology are not met, a transition may take longer than the aforementioned study's estimate and the benefits may be less than expected for some time.</p> <p>With that said, it is imperative for practitioners and researchers to identify preferred attributes of CVs, levels of WTP, pros and cons of the current system, suggestions for the improvement, and drivers' preferences. A preliminary review of literature, including a recent presentation on the preliminary findings for the recent driver clinic (Lukic 2012), found that few studies, if any, have utilized a sound methodology to estimate consumers' preferences for new vehicle technologies/equipment. The methodology employed by the reviewed studies is a direct question that asked participants the maximum dollar amount that they were willing to pay. However, this method is often criticized for not being able to identify tradeoffs that consumers make when evaluating bundled equipment attributes of CVS and for not being able to establish associations between participants' valuation and real purchasing (choice) behavior (Breidert, Hahsler and Reutterer 2006).</p> <p>Two classes of sound methods are available for estimating consumer preference structures and WTP - revealed preference methods and stated preference methods. The revealed preference</p>
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	<p>methods are based on the observation of market data or controlled laboratory experiment of consumer behaviors, while stated preference methods infer information from interviews and/or surveys. Conjoint analysis is chosen for our proposed study because it is a more appropriate methodology to identify preference structures and WTP for new products or products not yet on the market (Green, Krieger and Vavra 1997). Conjoint analysis is one of the stated preference methods. It is “a technique for measuring individuals’ preference structures via systematical variations of product attributes in an experimental design” (Breidert, Hahsler and Reutterer 2006). Since its introduction in 1971, conjoint analysis has been the most frequently used market research technique for measuring consumer preferences among alternative goods and services (Green and Srinivasan 1978). It is a more realistic method to estimate the psychological tradeoffs that consumers make when evaluating bundled products. It identifies not only the relative importance of product attributes, but also the most preferred bundles of attributes. This analysis will also help identify policy suggestions for increasing potential benefits of CVI based on understanding drivers’ preference structures. More discussion of the methodology is provided in the Proposed Tasks section.</p>
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	<p>Specific objectives are:</p> <ul style="list-style-type: none"> • To understand drivers’ preference structures based on a survey of three groups – (1) drivers who experienced CVs; (2) drivers who did not experience CVs, but have received detailed information on CVs; and (3) drivers with no knowledge about CVs; • To analyze the survey using conjoint analysis for identifying preferable sets of on-board equipment and WTP. • To identify pros and cons from the perspectives of survey participants of the existing CVI technology; <p>To provide suggestions to the government and the automobile and CVI technology manufacturers;</p>
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	<p>This study is still in progress, actual impacts and benefits of implementation will be determined in Winter 2014 when the study is completed. This page will be resubmitted in the next round of reporting to state these actual impacts and benefits.</p>
<p>Web Links</p> <ul style="list-style-type: none"> • Reports • Project Website 	<p>http://www.connectedvehicleinfrastructure-utc.org/?q=node/21</p> <p>https://rip.trb.org/browse/dproject.asp?n=33466</p>