THE UNIVERSITY OF IOWA

NATIONAL SAFETY COUNCIL

February 15, 2017

THE NATIONAL ADVANCED DRIVING SIMULATOR

University of Iowa
Automotive Safety Research & Education Campaign

NARRATIVE REPORT   **YEAR 3**

Table of Contents

 Correspondence should be directed to:

Daniel V. McGehee, PhD, Principal Investigator
Transportation and Vehicle Safety Research Program
University of Iowa, National Advanced Driving Simulator
2401 Oakdale Blvd, Iowa City, Iowa 52242
Tel. (319) 335-6819
Email: daniel-mcgehee@uiowa.edu

EXECUTIVE SUMMARY

In January 2014, the University of Iowa (UI) and its partners embarked on an automotive safety research program to develop and implement a National Education Campaign aimed at helping drivers understand advanced driver assistance systems (ADAS) and other safety-related features in their vehicles. The campaign sought to fill a major void in driver and consumer education: understanding the critical safety technologies that can save lives and prevent injuries on our American roadways.

First year efforts were focused on laying the foundation for the entire campaign by developing a firm understanding of the public's knowledge, awareness, and gaps in information available to drivers about ADAS and other safety technologies. The campaign's National Consumer Survey of Driving Technologies (National Survey) was the first of its kind to measure driver knowledge and understanding of ADAS technologies. The National Survey's findings guided the project team about current consumer and public knowledge, awareness, information-seeking, and motivation and influenced the development of the campaign theme and messaging, *MyCarDoesWhat*.

Second-year campaign efforts applied the results of the National Survey to the campaign development. Second-year campaign efforts concentrated on the continued development of the campaign brand, campaign messaging, and the implementation (formal public launch) of the campaign.

Year 3 Highlights

The *MyCarDoesWhat* campaign had an exciting final and third year, which included exceeding six billion media impressions and engaging in countless endorsement and partnership opportunities. Year 3 highlights include:

- Innovative campaign launch targets and strategies
- Expanded social media targets
- Website updates and upgrades
- Industry and safety professional outreach and partnership development
- Research projects finalization, reporting, and publication efforts
- Achievement of 6,025,281,083 impressions

This report describes the culmination of efforts in the third and final year of the campaign. This final report details all 11 campaign tasks, as well as the three automotive research projects that concluded in December 2016.

The UI and its partner, the National Safety Council (NSC), strongly believe the campaign's significant and over-whelming success is due to the data-driven approach the team employed and the constant improvement and evaluation of the campaign. Both the UI and NSC are delighted to share the Year 3 Final Report and continue to pave the road ahead for consumer education with ADAS technologies. The UI and NSC's work is just beginning and both entities have committed to finding innovative and creative ways to sustain project efforts after the close of the grant. *MyCarDoesWhat* will continue to be a key leader and player in the automotive and transportation landscape.

THE NATIONAL EDUCATION CAMPAIGN

The National Education Campaign continued to grow and expand the brand, messaging, and various media efforts in the third year. The UI team and project partners built upon the successful launch in Year 2 and gathered insight from the media metrics to improve the overall reach of the campaign. Year 3 largely concentrated on the completion of Tasks 6 – 14; however, this report also details updates to Tasks 1 – 4 made in Year 3 based on the metrics and evaluation completed during Year 3.

NATIONAL EDUCATION CAMPAIGN SCHEDULE	YEAR 1	YEAR 2	YEAR 3
Task 1. Campaign theme and message development	✔	✔	
Task 2. Develop instructional materials	✔	✔	
Task 3. Develop interactive games and apps	✔	✔	
Task 4. Develop videos for website, course materials and TV	✔	✔	
Task 5. Deploy campaign on website		✔	✔
Task 6. Deploy campaign using earned media		✔	✔
Task 7. Deploy campaign using PSAs			✔
Task 8. Deploy campaign using paid media		✔	✔
Task 9. Deploy campaign using social media		✔	✔
Task 10. Deploy campaign using safety advocate networks		✔	✔
Task 11. Outcomes assessment and final reporting			✔

Table 1: Tasks for the National Education Campaign

TASK 1. CAMPAIGN THEME AND MESSAGE DEVELOPMENT

Year 3 efforts for Task 1 focused on refinement of the messaging for the 30+ ADAS technologies available on the website, as well as the research and development of technologies that had recently come onto the market. The UI and NSC evaluated the performance of the existing messaging on the website and all media platforms (the website updates are discussed in-depth in Task 5). While the project team stuck with similar branding and aesthetics of the website, content was added for several technologies. Table 2 below reflects the technologies that received updated content in 2016, as well those that the team determined needed expanded content available on the website.

	CONTENT	
TECHNOLOGY	UPDATED	EXPANDED
Automatic Parallel Parking	✔	
Adaptive Cruise Control	✔	
Back-Up Warning	✔	
Forward Collision Warning	✔	
High Speed Alert	✔	✔
Obstacle Detection		✔
Parking Sensors		✔
Push Button Start	✔	
Sideview Camera		✔

Table 2: Technologies Receiving Updated or Expanded Content

Audience Segmentation and Messaging Implementation

As discussed in the Year 2 Report, the team decided to focus 2016 messaging and delivery efforts to specific audience targets. The team examined social media analytics and consumer research to understand the market demographics most likely to purchase or utilize vehicles equipped with ADAS technologies. Additionally, the team worked closely with the project's PR firm, MSL Qorvis, to thoroughly evaluate the targets (including motivations behind wanting ADAS technologies) and how to best plan the approach of reaching each target. Profiles of each audience segment were created as a starting point for a larger set of initial audience targets brainstormed by the team. After discussion around the possible targets, the team completed a thorough research audience segmentation matrix (Appendix A) to understand the demographics and safety factors of each target. The targeting strategy included dividing the audience into a series of definable, addressable subgroups and to determine where these groups seek information and consume media, websites, and socialize. The team identified the following audience targets to concentrate message outreach to:

• New car buyers/lessees
• The tech savvy
• Drivers interested in safety:
  o Older drivers
  o Families with young children
  o New drivers and their parents
• Car enthusiasts

Figure 1: Example of the audience segmentation profile created for each segment

Task 5 will detail the *MyCarDoesWhat* website redesign efforts that specifically targeted these audiences, and Task 9 will discuss the social media engagement approach that was undertaken to connect with these demographics.

What's Next?

After the close of the grant, the UI and NSC will re-evaluate vision and re-direction opportunities available to the *MyCarDoesWhat* project. MCDW has been brand agnostic throughout the program. The project team has received feedback about the expansion into specific manufacturers' brands and trims, as well as the consumer education into higher levels of vehicle automation. Upon close of the grant, the UI and NSC will fully evaluate the message metrics and utilize all data and analysis to drive future message and theme development.

TASK 2. DEVELOP INSTRUCTIONAL MATERIALS

TThe UI College of Education continued their development of instructional materials during the third year.

Deeper Learning Updates

In the third year, the UI began the instructional material design efforts by evaluating performance of the initial three key technologies placed on the "Deeper Learning" component of the *MyCarDoesWhat* website during the second year (adaptive cruise control, back-up camera, and blind spot monitor). The original motivating factor for selecting these three technologies was based on market penetration and analytical performance data on the larger website. During the review, analytics showed strong performance for "average times on page" for all three of the original technologies and the "exit rates" were, on average, better than the rest of the website. The Adaptive cruise control "Deeper Learning" section showed some of the highest "average time on page" performance, likely due to the simulation-game developed by the UI that was placed directly into the section.

To determine a new round of technologies to include in the "Deeper Learning" component of *MyCarDoesWhat*, the UI again looked at overall market penetration and general performance data on the website. In conjunction with this, the UI also analyzed the performance of the initial "Deeper Learning" pages, as well as performance of the technologies on the main pages of the website. With this information, the UI selected three new technologies to be added to the "Deeper Learning" section in 2016: forward collision warning, lane departure warning, and rear cross traffic alert.

Figure 2: Examples of the "Understand" and "Challenge" sections on the *MyCarDoesWhat* "Deeper Learning" pages

The three new technologies added to the "Deeper Learning" section feature downloadable PDF content for viewers, including the "Understand" and "Challenge" sections. The "Understand" and "Challenge" sections are specifically designed for instruction-style format, to offer content that may be used in driver's education classes or other settings to evaluate a driver's understanding of the technology in a graphical format with real-world situations of the technologies.

The UI and NSC have made several partnerships within the transportation and driver safety industry to promote the free downloadable "Deeper Learning" content and PlAyCC driving simulation game to driving instructors and driving program curriculums across the country. Please reference Task 10 (Partnerships, Collaborations, and Sharing) for detail on the partnerships created with the National Automobile Dealers Association, Iowa Department of Motor Vehicles centers, and local driver education organizations.

Collaboration Research Study

The UI College of Education finalized the study test plan for the Collaboration Research and entered the study into field. The study included an assessment of the effectiveness of the adaptive cruise control instructional materials and the transfer-of-training to research subjects. The study examined a total of 10 participants, accounting for 5 dyads. All dyads played PlAyCC game and then were coded for each correct answer by the researchers. The main findings from the study included that the top performing dyads engaged in more collaborative problem-solving events in all areas than did the bottom performing dyads. Additionally, the top performing dyads persisted longer in their problem-solving and subsequently undertook more collaborative problem-solving moves at later times, whereas the lower performing dyads often stopped making these collaborative problem-solving moves just after

a few minutes. The researchers believe their developed Collaboration Research methodology can be expanded in the future for further analysis on learning in dyads, which the UI's foundational National Survey Research findings supported as consumers reported a preference for seeking information about their technologies from family and friends.

What's Next?

After the close of the grant, the UI will continue to evaluate the performance of the *MyCarDoesWhat* website's "Deeper Learning" section and how it may be expanded or revamped in the coming years. Additionally, the team will continue to reach out to various driver's education and consumer outreach organizations to promote and improve awareness of the "Deeper Learning" downloadable materials for classroom and learning settings.

## TASK 3. DEVELOP INTERACTIVE GAMES AND APPS

Task 3 efforts through the life of the campaign featured the development of a total of three different gaming experiences that targeted audiences in various media platforms.

The UI and NSC wanted to expand the gaming platform to a web-based presence that would allow for a salient user experience. A new web-gaming platform offered the ability to deliver ADAS technology messaging in creative ways to specific audiences (such as millennials and the tech savvy), that may not otherwise receive the campaign messaging.

The campaign created Dashboard Blitz (mobile application, created in Year 2), Which Dashboard Icon Are You Today? (Facebook game, created in Year 2), and Dashboard Scramble (Facebook game, created in Year 3). Each game developed during the life of the campaign was designed to have educational elements of the ADAS technologies, as well as encourage players to visit *MyCarDoesWhat* and share both the game and campaign website with others in their social network.

Dashboard Blitz

Dashboard Blitz formally launched in Year 2. Dashboard Blitz Year 3 efforts concentrated on improving overall user experience with infrastructure improvements, character additions, bug fixes, and new in-game upgrades, as well as adding a "Second Help" feature. The "Second Help" feature focused on providing a second round of information to the participant. During the life of the campaign, Dashboard Blitz had 188 Apple App Store and 96 Google Play downloads, resulting in a total of 284 downloads.
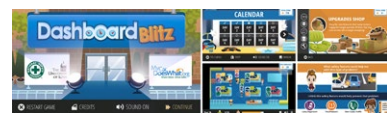
What Dashboard Icon Are You Today?

The Facebook game, Which Dashboard Icon Are You Today?, continued to have a presence on the *MyCarDoesWhat* Facebook page throughout Year 3. Which Dashboard Icon Are You Today? was played a total of 6,961 times throughout the campaign.
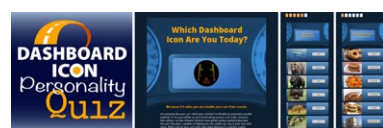
Dashboard Scramble

Building upon the success of Dashboard Blitz and Which Dashboard Icon Are You Today?, the team wanted to offer an additional gaming platform that provided vehicle technology education in a quick, intuitive format that would encourage repeat and high usage. The team worked with their previous contracted partner, KW2 in Madison, WI to create a high usage game that would also be available on the *MyCarDoesWhat* Facebook platform. After several brainstorming sessions and analysis of the possible metric outcomes, the team decided on the game titled Dashboard Scramble. The Facebook game features 12 of the ADAS technologies on the website and provides the user a quick, intuitive exposure to the technologies. Dashboard Scramble was viewed 1,100 times and played a total of 45 times.

What's Next?

After the close of the grant, the UI and NSC will continue to evaluate the performance of Dashboard Blitz, Which Dashboard Icon Are You Today?, and Dashboard Scramble. Updates, improvements, and enhancements will continue to be made as funding is available and as interest from fellow partners is presented to the campaign. The team believes the gaming platforms created during the campaign reach unique and specific audience targets that may otherwise not be interested in the traditional campaign media platforms.

TASK 4. DEVELOP VIDEOS FOR WEBSITE, COURSE MATERIALS, AND TELEVISION

The project team focused Year 3 efforts for Task 4 on updating the existing videos produced in Year 2 and creating, developing, and producing new video concepts that would reach specific target audiences. New creative direction included reach to the baby boomers generation, millennials, and those interested in the deeper technological aspect of ADAS technologies. The following video concepts were created and introduced via the campaign outlets in 2016: MyCarBabies, Savvy Seniors, and Techspert (all available in the "Video and Graphics" section of the website). Each concept includes a series of videos, with each video featuring an ADAS technology. The varying concepts pull consumers into the campaign through a non-traditional advertising sort of messaging to peak curiosity, engagement, and create differing brand recognition to the *MyCarDoesWhat* campaign.

Year 3 efforts also included developing additional content for technologies that experienced high visitor rates and performance on the website in Year 2. Mini-instruction videos were created for pedestrian and bicycle detection, hill start assist, hill descent assist, and cold temperature warning.

MyCarBabies

The NSC created several videos in the MyCarBabies series. Each video features either a small baby animal (kitten, puppy, etc.), or a human baby. Each short video (less than two minutes) includes light, playful musical audio in the background and one of the animal babies or a human baby. After a few humorous captions about the babies not being cars, viewers are directed to *MyCarDoesWhat* to learn more.

Figure 4: Example of MyCarBabies video from the *MyCarDoesWhat* website

Savvy Seniors

The NSC created four Savvy Seniors videos in Year 3. Each video features senior-aged individuals discussing their experiences in their own vehicles, as well as experiences with the ADAS technologies in the campaign. The videos are tailored to attract the baby boomer generation by featuring characters that have similar life experiences and are in similar points in their lives.

Automotive Safety Features for Savvy Seniors

Figure 4: Example of Savvy Seniors video from *MyCarDoesWhat* website

Techspert

The Techspert video series created by the NSC features an engineering Ph. D. student at the University of Wisconsin—Madison (and UI alumnae). The graduate student, Morgan Price, discusses "how the technology works" from an engineering perspective and explanation. The videos provide higher levels of detail and the engineering side of the technology. These videos are intended to target those more interested in the technological aspect of the technology and how it works. Although this audience may be a small set of the overall public, they may be the most likely to be early adopters of the technology and show great promise for truly understanding how the technology works in their vehicle.

Teachspert Morgan Price: Brake Assist

Figure 5: Example of Techspert video from *MyCarDoesWhat* website

What's Next?

After the close of the grant, the project team will continue to update the existing video series created during the campaign, as well as continue to search and create video series that attract the American driving public in new and different ways. It is essential to reach consumers repeatedly through a variety of ways to encourage constant engagement and interest in the brand.

TASK 5. DEPLOY CAMPAIGN ON WEBSITE

Throughout Year 3, the project team undertook a revamping the website, which included: home page updates, creative landing page designs, message delivery updates, and right-side ticker updates. All updates were based on the analytics performance and qualitative data collected from actual website users that had provided feedback.

Website Evaluation Metrics

All content and design changes and updates were considered with strong regard for the website's performance metrics. As noted in the Year 2 Report, the NSC team programmed evaluation metrics into the website using the iPerceptions interface that allows new and unique visitors to provide feedback regarding their experiences with the site. In the early part of Year 3, the project team discussed some of the analytical data and feedback in iPerceptions to help drive the upcoming website updates. After reviewing the data and brainstorming, the team concentrated on improving the following areas of the website: site loading issues, smartphone user experience, search engine optimization, and content updates for specific technologies on the website.

Figure 6: Age distribution of *MyCarDoesWhat* website visitors
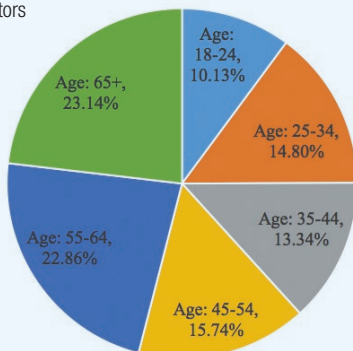
Home Page Updates

The homepage experienced a significant upgrade by adding a rotating background picture to connect with a variety of audiences. Additionally, a right-side ticker was added that features relevant news or website elements that the team believes should be highlighted front and center to increase traffic. Within the website, several of the technology's individual pages were updated, including the "Quick Guides," "How it Works," and "Q & A" sections. The "Q & A" sections were updated to expand information about the technologies and answer questions that were provided as feedback by actual website visitors. The most common asked and most relevant questions provided in the website feedback surveys by visitors were the questions that were added into the Q&A section.
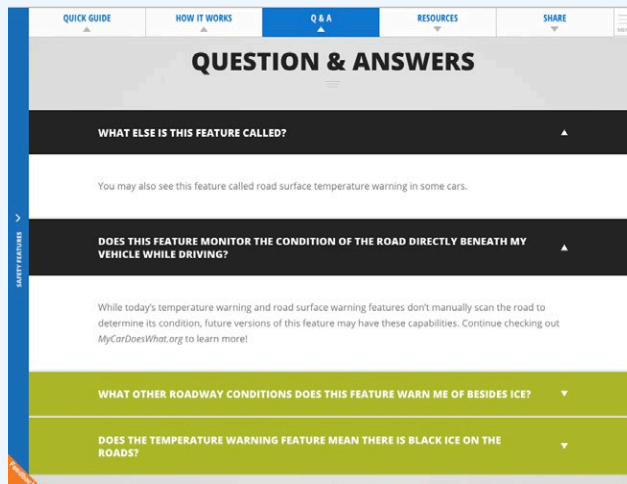

Figure 7: Screen shot of updated "Q & A" section of the *MyCarDoesWhat* page

As described in Task 1, the team undertook a creative website landing page redesign to reach the specific audience targets identified in the segmentation analysis. A small creative firm was brought on under MSL Group's efforts to design three specific landing pages that would target each audience. The targeting strategy for each audience was designed to attract visitors with generic, more basic content at the beginning of their experience and then expose them to deeper levels of information as they move through the *MyCarDoesWhat* website. The team identified that the benefits of this approach included a greater chance of getting the target audience's attention and higher shares and engagement among the segmented group. Additionally, this approach would allow the team to measure and adjust each segmented campaign's message and creative compared to the overall campaign performance.

The landing pages were tied to paid media advertisements (internet) that would attract the user given their appearance and overall angle. Pre-determined selection criteria (of the user) were identified by the team to trigger the banner advertisement appearance on websites that allowed advertisements and from which the team had purchased advertising space. Each of the landing pages accompanying banner advertisements is presented and discussed in the Task 8 section.

The three landing page designs created in Year 3 were: Car Nuts, Get Home Safely, and Secret Agent. Each creative presents the ADAS technology list (found on the left side of the regular *MyCarDoesWhat* homepage) in a slightly different manner, including different overall creative style, different graphics, and different presentation and selection of the technologies featured on each creative landing page.

Car Nuts

The Car Nuts landing page was created to target the tech savvy audience, those that may consider cars a hobby or passion, and those that simply enjoy the technology/mechanical aspect of cars. The creative features a highly graphical representation of a garage space and a tool shop workbench to attract audiences with a more technological/mechanical interest in vehicles. The presentation of the technologies is accomplished on a clipboard to go along with the "roll up your sleeves" style of the creative.
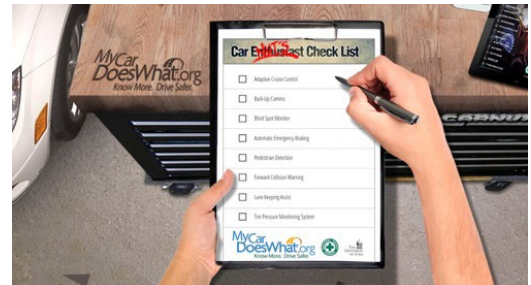

Figure 8: Car Nuts landing page

Get Home Safely

The Get Home Safely landing page was created to target families with children in the vehicle. The creative was a realistic, semi-cartoon style layout of a scene commonly found on an American roadway. The creative features three different technologies, randomly selected and individually displayed on the webpage to the user. The creative displays a typical streetscape with pedestrians, bicyclists, and typical urban environment. The urban environment elements that the technology focuses on are highlighted with color while the remainder of the graphics are greyed out. The creative was designed to focus on the technology's core concepts, including the obstacles or the technology's detection zone.

Figure 9: Get Home Safely landing page

Secret Agent

Similarly to the Car Nuts creative design, the Secret Agent landing page was created to attract all audience segments with specific focuses on the car enthusiast, tech savvy, and those interested in the latest and greatest safety technologies in vehicles today. The creative is a cartoon-like design that features a vehicle front and center of the page, highlighting each ADAS technology's location on the vehicle. The creative points to the technology's sensor or physical location to provide further education and intrigue. The user can click on each technology specifically to get to the technology's individual webpage.

Figure 10: Secret Agent landing page

What's Next?

After the close of the grant, the team will continue to analyze the performance metrics and analytics of the website, including the performance of each technology page. The website serves as the main housing of the campaign's materials, downloadables, and message content and the project team believes its success is dependent on regular reformatting and updating of content. The team will consider additional content areas related to ADAS technologies that may have a place on the website given their importance to the automotive safety field.

TASK 6. DEPLOY CAMPAIGN USING EARNED MEDIA

During Year 3, the project team built on the enormous success of the earned media achievements. Earned media encompasses any exposure of the campaign that is gained through promotional efforts and does not include any formal purchase of media. Earned media continues to be one of the highest performing media plans of the entire campaign.

Year 3 earned media efforts concentrated on several satellite media tours, automotive press association briefings to automotive journalists (both print and internet), attendance at significant industry conferences and automotive shows, and relevant news and press releases regarding news topics specific to ADAS technologies. Coverage included distribution via the Associated Press (AP) wire, Public Relations News wire (PR News), and via the social media outlets.

The NSC originally anticipated the campaign could achieve 750 million earned media impressions. The earned media accounted for 5,172,357,292 impressions, or 85% of the all impressions of 6,025,281,083.

Satellite Media Tours

NSC President and CEO, Deborah Hersman, and Project Principal Investigator, Daniel McGehee, participated in several satellite and radio media tours to reach drivers at various points and during annual peak driving times. Each of the tours are summed up below.

• July 4, 2015 Radio Media Tour about travel tips with Deborah Hersman and Daniel McGehee

Media Coverage (Source)	Impressions
24/7 News Source – June 29	3,000,000
Associated Press Radio – June 29	1,860,000
Georgia News Network, June 29	81,000
American Urban Radio – June 30	1,500,000
Illinois News Connection – June 30	90,000
Bobby Likis Car Clinic – July 2	165,000

Table 3: July 4, 2015 Holiday Travel Radio Media Tour Top Hits

• October 8, 2015 Satellite Media Tour with Deborah Hersman about the campaign launch

Media Coverage (Source)	Impressions
CBS News path	Not available
NSC News Channel	551,811
WTHR-TV (Indianapolis)	53,071
KUSA-TV (Denver)	41,820
WBBM-TV (Chicago)	21,203

Table 4: October 8, 2015 Campaign Launch Satellite Media Tour Impressions

• December 2016 – Satellite Media Tour with Daniel McGehee to focus on winter weather driving (Individual impressions not available)

Media Coverage (Source)	
Sirius XM Radio – David Akerly - about commercial trucker driving and winter driving safety – December 2, 2016	
WILS-AM (Lansing, MI) – December 5, 2016	
Debbie Lagaza – #1 News/Talk station (Milwaukee, WI) – December 5, 2016	
WBAL-AM - Stacy Lyn (Baltimore, MD) – December 5, 2016	
WJR-AM – Dick Haefner (Detroit, MI) – December 5, 2016	
KSMU-FM - Karen Wright – Public Radio Station (Mankato, MI) – December 5, 2016	
WWJ-AM – Brian Larsen (Detroit, MI) – December 5, 2016	
WTMJ-AM – Steve Ketelaar (Milwaukee, WI) – December 5, 2016	
Northern News Network – Brian Bennett (Statewide news network with 31 affiliates) – December 8, 2016	
Total impression numbers	**85,463,404**

Table 5: Winter Weather Satellite Media Tour - December 2016 Coverage

Automotive Press Association Briefings

The team identified the automotive press associations across the country as a key outlet to reach interested drivers. These journalists focus their coverage solely on automotive-related news stories. During each briefing, one project team member from both the NSC and UI attended the briefing and presented on key data behind the campaign, the campaign and its achievements, and how the press association can become or stay engaged in the campaign efforts. Each of the instrumental briefings are noted below.

- Washington Automotive Press Association (WAPA) – January 27, 2016 (Washington, DC)
- Automotive Press Association (APA) – March 1, 2016 (Detroit, MI)
- Midwest Automotive Media Association (MAMA) – April 6, 2016 (Chicago, IL)
- Western Automotive Journalists (WAJ) – July 21, 2016 (San Francisco, CA)
- International Motor Press Association (IMPA) – November 2, 2016 (New York, NY)

Press Releases and News Hooks

The MSL Group led the team in consistently releasing timely press releases and news hooks to maintain a *MyCarDoesWhat* presence in the industry and news media conversation. The press releases allowed the campaign to share tips with drivers and promote its educational tools online throughout the country's newspapers. Topics and related impressions were as follows:

- 100 Deadly Days – June 2015: 70,476,115 impressions
- *MyCarDoesWhat* launch – October 2015: 74,631,557 impressions
- Winter weather driving – December 2015: 71,882,056 impressions
- Winter weather driving – December 2016: 85,463,404 impressions

Awards

The *MyCarDoesWhat* campaign was honored with several reputable PR awards throughout Year 3. The five awards are listed below:

- North American Excellence Association for Association Campaign of the Year
- Thoth Award Certificate of Excellence for Public Service
- Platinum PR Award for PSA
- Platinum PR Award for Public Affairs (finalist)
- International Communications Consultancy Organisation for Non-profit (finalist)

All related earned media speaking engagements are noted in (Appendix B).

Figure 11: *MyCarDoesWhat* Principal Project Investigator, Daniel McGehee briefing Washington Automotive Press Association in Washington, DC
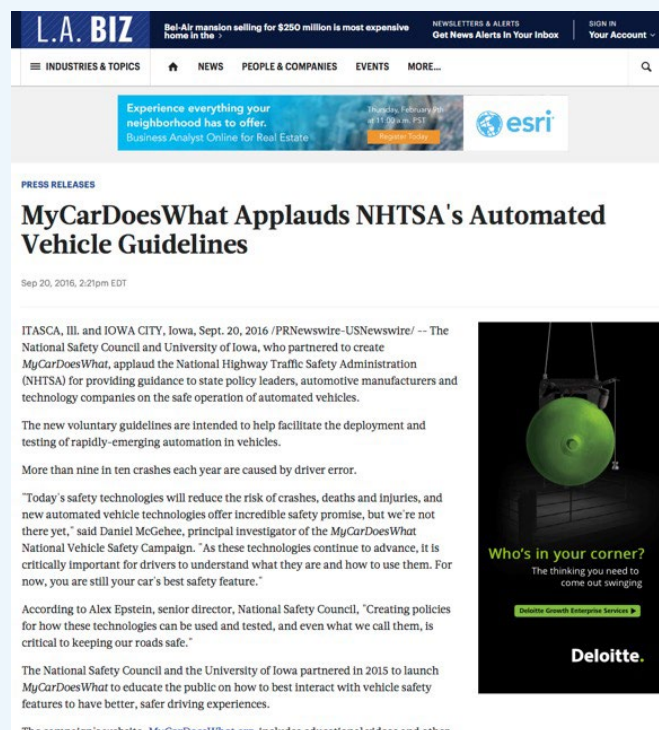

Figure 12: *MyCarDoesWhat* September 20, 2016 press release

What's Next?

After the close of the grant, the team will continue to deploy attractive content to capture earned media impressions. The team recognizes the critical component and opportunity that earned media itself presents, given its affordability and ample access to journalists and the media with the internet. Given the unique and ever-changing climate of ADAS technologies, the team believes some of the campaign's greatest opportunities lie in being the credible, trusted source when it comes to ADAS technologies.

Figure 13: PSA placements for the *MyCarDoesWhat* campaign

TASK 7. DEPLOY CAMPAIGN USING PUBLIC SERVICE ANNOUNCEMENTS (PSA)

The team continued with the efforts of the originally established PSA creative formally announced during the October 2015 campaign launch in Washington, DC. The MSL Group developed the attention-grabbing cartoon PSA that quickly relays the campaign's purpose and pushes viewers to the website. In Year 2, the PSA task efforts focused on the creative development and messaging of the PSA. Year 3 efforts included placement of the PSA in several critical networks (Figure 14 below). Paid PSA placements in Year 3 resulted in adding 11,907,966 impressions to the campaign's total impressions.

Year 3 efforts expanded the PSA theme to cover new technologies. The NSC team produced a series utilizing the PSA that translates the technologies to humorous, non-vehicular scenarios under the theme, "If we all had <insert technology>." Each video featured one technology and provided a human-level example of how it would help the individual in that scenario if they had that particular technology. For example, in the back-up camera video, a new dad is attempting to quickly check on his sleeping child without making any noise. Upon backing away from the child's crib, he fails to see the cat directly behind him. He steps on the cat, creating a great deal of noise, and subsequently waking up the child. The next few frames showcase how the scenario could have been avoided with a back-up camera, as the dad would have been alerted to and displayed a view of the cat when backing. The overall goal of the PSA is to illustrate how the technologies can assist and make everything safer via imaginative, humorous scenarios.

Figure 14: Still images of each of the three newly developed PSAs in Year 3. The featured technologies include: back-up camera, lane departure warning, and automatic emergency braking

What's Next?

After the close of the grant, the team will continue to explore the opportunities to circulate the PSA among national networks as well as the role PSA will continue to play on social media to raise awareness. The team anticipates as the campaign continues to move towards centering higher levels of vehicle automation, PSAs will play a vital role in the education of the American public, and *MyCarDoesWhat* has a tremendous opportunity to lead the public outreach, education, and awareness effort and promise of these technologies.

Figure 15: Advertising of the *MyCarDoesWhat* campaign at the Automated Vehicles Symposium in San Francisco, CA, July 2015.

TASK 8. DEPLOY CAMPAIGN USING PAID MEDIA

During Year 3, the team built upon the paid media plan advised by MSL Group in August 2015. Year 2 largely focused on generally advertising the campaign's brand and name by reaching consumers when they were in their physical vehicle (via radio advertisements, highway billboards, and Gas Station TV (GSTV)), whereas Year 3 connected with the audience targets at a deeper level. Year 3 paid media efforts focused on digital and traditional paid media. Efforts encompassed digital banner advertisements that supported each of the creative website landing page designs by pushing individuals to those landing pages, as well as deploying paid search terms to steer viewers searching for similar terms to the *MyCarDoesWhat* website. Additionally, print ads were placed in the January 2016 Transportation Research Board Annual Meeting, the 2016 onsite program for the Association of Unmanned Vehicle Systems, and the Fall 2016 American Association of Motor Vehicle Administrators magazine. The campaign is pleased to report that paid media efforts resulted in adding 722,762,453 media impressions to the campaign's impression total. The table below references all paid media strategies utilized throughout the campaign. Please note, Year 3 focused on the digital advertising efforts.

Media Channel	Benefits
Out of Home (Gas Station)	• Leverage channels 100% targeted to drivers while they are not in motion • Proof of performance-audited impression numbers • Can reach top markets-Top 12 U.S. markets, 33% U.S. coverage
Radio	• Connects with motorists in their vehicle while their safety is top of mind • Covers 98% of the U.S., in 200 markets
TV and Print Public Service Announcement	• No cost • Value-add impressions
Digital & Search Ads	• Targets audience • Drives quality traffic back to website • Helps with efficiency and engagement

Table 6: Paid Media Strategies Utilized Throughout the Campaign

Creative Landing Page Paid Banner Ads and Paid Search

In support of the landing page designs targeted to specific audience segments, the project team created and deployed banner advertisements that would appear on various webpages, based on a viewer's browsing history. As the team embarked on this strategy, adjustments were made each month to maximize viewers and clicks to the website. The team monitored the cost-per-click and click-through-rates to modify the schedule as needed for most efficient delivery for the dollars invested.

In Year 3, the team also evaluated the performance of the paid search efforts from Year 2 and revised the plan as necessary. The efforts in Year 3 paid search built upon the efforts of Year 2. The team selected technologies that each of the segmented audience groups would be most likely to be interested in. The team used the audience segmentation analysis, market penetration, and the website analytics to select the technologies that best represented each group. For example, Figure 17 represents the search that would have come up had the user typed in "back up cameras" in the Google search bar. Each search represented a variety of spellings and appearance of the technology. For example, the back-up camera technology search terms would have encompassed the following variances in spelling and terminology: back-up camera, back up camera, rear view camera, backup camera, etc. All paid search efforts were programmed for a personal computer (PC) and mobile display.

Figure 16: Examples of landing page banner ads for targeted audiences
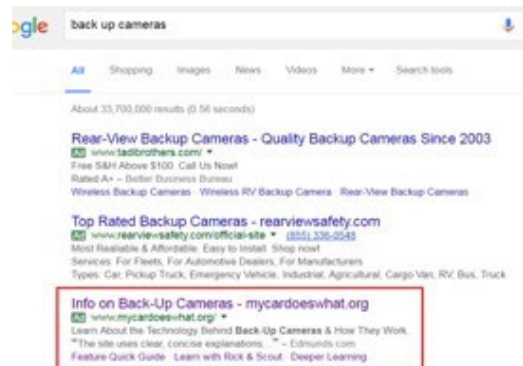

Figure 17: Example of paid search efforts of the back-up camera

What's Next?

After close of the grant, the team will continue to monitor the effectiveness of paid media advertising. The team's research continues to show that Internet search is one of the preferred methods of Americans for collecting information. As *MyCarDoesWhat* continues to be the key leader and credible source in ADAS technologies, the campaign will strive to reach all consumers in search of information on the technologies. The most effective use of ADAS technologies, leading to the translation of the technologies' benefits on the roadway, will only happen if consumers know how to use the technologies. The team recognizes paid search's ability to reach those consumers that are top-of-mind-awareness and actively searching about ADAS technologies.

TASK 9. DEPLOY CAMPAIGN USING SOCIAL MEDIA

The team had an active and exciting year in the social media realm. Year 3 efforts focused on continuing to build the social media identity for the campaign, active and pertinent posting, and increasing engagement across the social media platforms (Twitter, Facebook, YouTube, Vine, and LinkedIn). The campaign's main message boards to communicate with followers and the general social media public continued to be Facebook and Twitter throughout Year 3. Year 3 social media efforts focused on social media analytics evaluation, refined strategy tactics based on evaluation, and frequent updates of the *MyCarDoesWhat* blogs. The *MyCarDoesWhat* social media platforms achieved a total of 41,158,944 Facebook users reached and a total of 2,667,250,497 potential social media impressions.

Social Media Analytics

The team began Year 3 with an in-depth review of the social media platform's performance. Social media offers some of the greatest potential for engagement and ability to capitalize on earned media. The team frequently analyzed the performance of various types of social media messaging to understand where the greatest potential lies for making the campaign dollars stretch farther and reach greater segments of the population. The team analyzed and compared the performance of all campaign messages including: the performance of the paid social media, press releases, blogs, tweets, posts, etc. The team considered how these different message types translated to sessions, page views, and engagement on the website. Based on the performance and team discussion, the team would revise and tweak the campaign as needed to maintain high traffic and engagement volume.

MyCarDoesWhat Blog

During Year 3, the *MyCarDoesWhat* blog (which resides within the website) experienced heightened usage and expanded content. With the help of the MSL Group, the team assembled a blog calendar that featured timely and seasonal topics and prevalent industry voices. The blog featured a total of 26 different posts from several different authors, both from within the *MyCarDoesWhat* campaign as well as third-party.

What's Next?

After the close of the grant, the team will continue to maintain the campaign's social media presence. The social media platforms offer some of the best quality engagement opportunities to discuss the ADAS technologies with the general American consumer. Additionally, social media offers consumers quick, easy access the *MyCarDoesWhat* campaign, so being persistent, relevant, and timely on the social media platforms will continue to be a priority for the team.
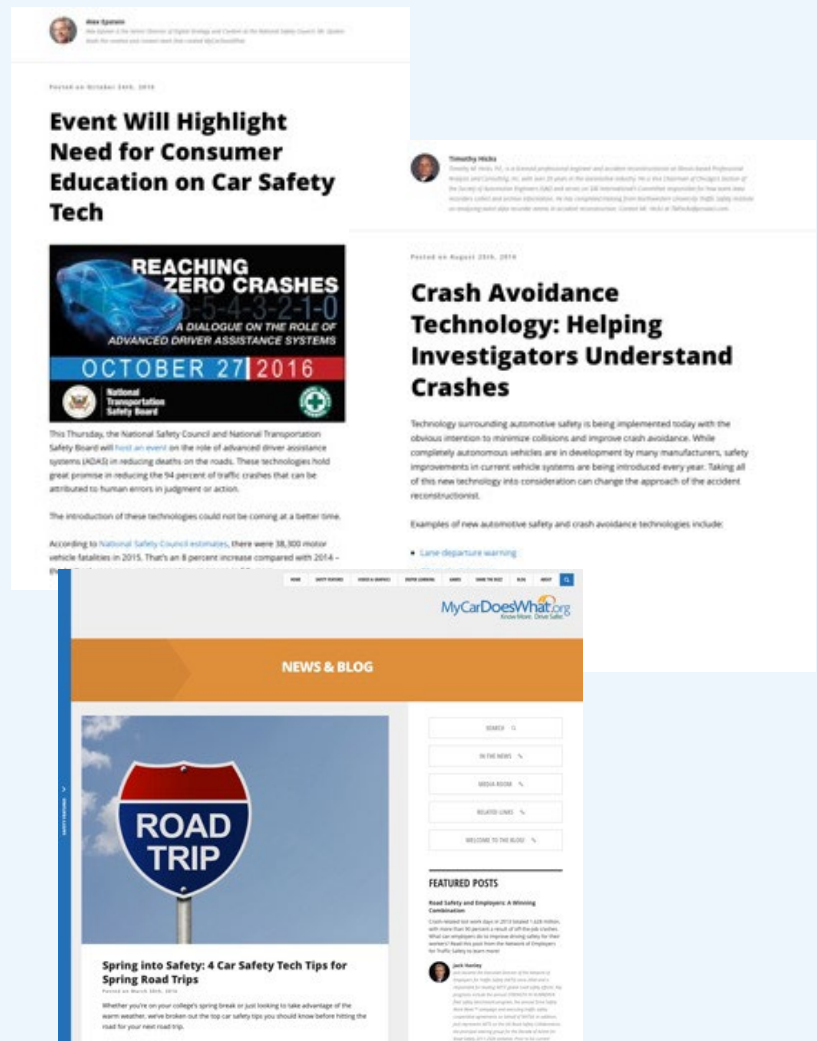

Figure 18: Examples of the *MyCarDoesWhat* blog and blog posts over Year 3

TASK 10. DEPLOY CAMPAIGN USING COMMUNICATION THROUGH SAFETY ADVOCATE NETWORKS

TYear 3 efforts built upon the strong base and network that the *MyCarDoesWhat* team established in Year 2 as word spread about the campaign's purpose and objectives. The team continued to meet with high-ranking industry officials present at several critical transportation safety and research conferences, and established key collaborations with industry leaders who play a direct role in the automotive consumer process.

Industry Official Meetings

The team briefed several of the large original equipment manufacturers (OEM) about the campaign efforts and possible opportunities for collaboration after close of the grant. All meetings occurred on-site at each of the OEMs and discussions included both the campaign education opportunities unique to their brand and the research potential of their specific ADAS technologies.

Partnerships, Collaborations, and Sharing

As the team continued to spread the word about the campaign and increase public awareness about ADAS technologies via the campaign's communication channels, organizations have approached *MyCarDoesWhat* on possible collaboration opportunities. Each organization brings a unique perspective and consumer insight to *MyCarDoesWhat* and reaches the consumer from a different angle than has historically been utilized by campaign efforts. The campaign was highly successful with forging several critical partnerships across the transportation safety industry. The partnerships permitted *MyCarDoesWhat* to leverage each partner organization or collaborator's social media followings, websites, newsletters, and relationships to help publicize the campaign, including significant speaking opportunities for *MyCarDoesWhat*. Appendix B includes the complete list of speaking engagements and other opportunities used to promote *MyCarDoesWhat*, but a few of the critical partnerships are described in detail below.

American Association of Motor Vehicle Administrators (AAMVA)

The first major partnership formed during the campaign was the relationship between AAMVA and *MyCarDoesWhat*. AAMVA is a voluntary, non-profit association of state and provincial motor vehicle administration officials across the U.S. and Canada. This organization serves as an information clearing house for its members, providing resources and promoting collaboration and information sharing to encourage more effective public service. Common members of this organization include departments of transportation, motor vehicle departments, and other entities interfacing with the driving public.

In Year 3, the Iowa Department of Transportation Motor Vehicle Division committed to serving as the initial test pilot to display *MyCarDoesWhat* materials in their Department of Motor Vehicle (DMV) service centers. The pilot started with DMV centers near the state capital and subsequently made *MyCarDoesWhat* materials available to all DMV service centers in the state. The pilot allowed the team to connect with the Motor Vehicle Network (MVN), a media agency that owns exclusive rights to several DMV service centers' television content across the country. Many DMV service centers (including Iowa) uses the MVN's broadcasting rights to televise content in the DMV service center rooms. Below are two pictures from the DMV service center pilot in Iowa. This partnership allows the campaign to push content out to viewers when driving is top-of-mind and they have time to focus on content. Through the MVN's programming, the *MyCarDoesWhat* material includes several references to the website to encourage the user to visit MyCarDoesWhat.org, videos about the technology, and other educational materials that can provide the consumer with the opportunity to learn something new about ADAS technologies.
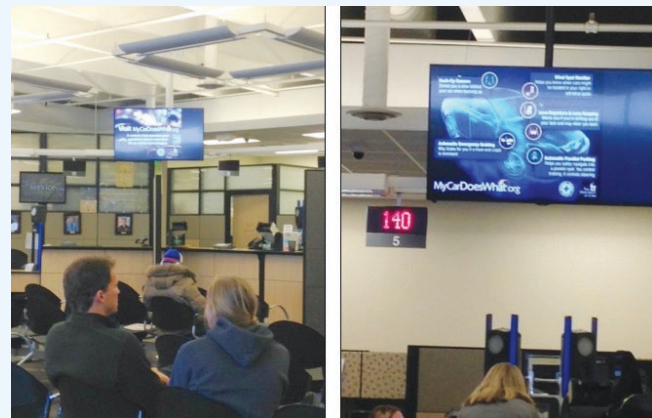

Figure 19: *MyCarDoesWhat* content shown in a DMV service center in Des Moines, IA

The team is thrilled to report that, after a successful pilot in the Iowa DMV service centers, MVN made the offer to reach out to other state DMVs and DOTs to provide the *MyCarDoesWhat* content in their service centers as well. To date, the following states have agreed to include *MyCarDoesWhat* content in their DMV service centers: North Carolina, New York, South Carolina, Florida (state and seven counties), Texas (Denton County), Delaware, and Pennsylvania.

National Automobile Dealers Association (NADA)

NADA invited *MyCarDoesWhat* to their annual convention to announce a partnership between the campaign and NADA. NADA is an association that represents car and truck dealerships across the country to provide support, education, guidance, data and evaluation, and general resources. The partnership between NADA and *MyCarDoesWhat* includes a connection between the campaign materials and the actual dealerships that sell vehicles equipped with several of the ADAS technologies. This connection allows dealers direct access to materials that they can use in their dealerships and pass along to the consumer. Additionally, NADA also appreciates the value *MyCarDoesWhat* materials and website can have for dealership employees, further helping them to become more informed about the ADAS technologies they sell.

American Driver and Traffic Safety Education Association (ADTSEA)

The ADTSEA made a formal request of the *MyCarDoesWhat* campaign to utilize educational videos and graphics in their coursework and curriculum that is distributed to driver's education instructors nationwide. The project team will continue to work with ADTSEA to identify the content that is the best fit for their curriculum and covers the ADAS technologies to the depth they are looking for.

What's Next?

After close of the grant, both the NSC and UI teams believe the partnerships and collaborations made through the campaign represent some of the greatest growth potential and direct engagement with consumers. *MyCarDoesWhat* has been able to reach consumers at the dealership (purchase point) level, education level, and government level with their formal relationships forged during the campaign. The team will continue to reach out to organizations that engage and impact consumers at different points during the driving and vehicle experience to foster new relationships and collaborations. The team realizes that one of the campaign's greatest strengths is the material's easy tailoring ability. This allows for flexibility of distribution and crafting of the materials for specific audiences. The UI and NSC teams will continue to establish new partnerships and opportunities in the years to come
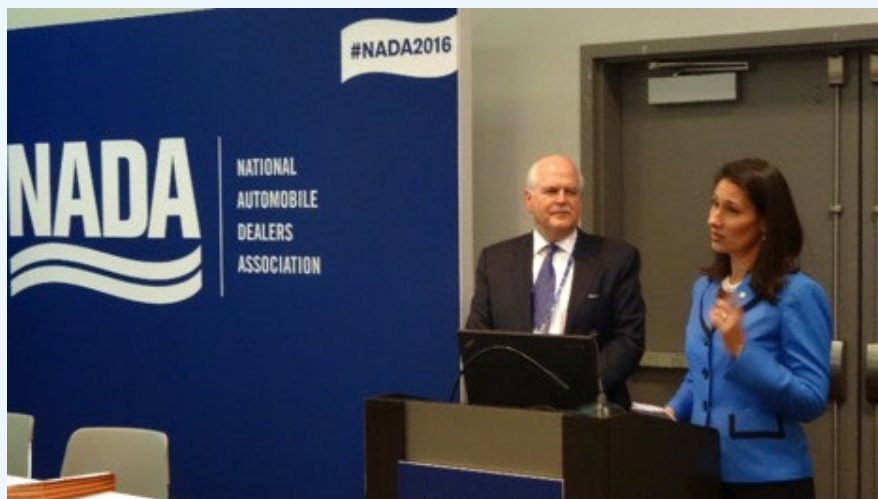

Figure 21: NSC President and CEO Deborah Hersman speaking at NADA 2016

TASK 11.
OUTCOMES ASSESSMENT AND FINAL REPORTING

One of the largest undertakings of the campaign in Year 3 was the outcomes assessment and final reporting of the *MyCarDoesWhat* effort. Per the original proposal, the UI tracked impression metrics to assess the overall impressions achieved by mode during the campaign. These impression metrics are covered in the proceeding subsection. As each of the previous sections in this report detailed the changes made based on team assessment and evaluation, this section will primarily focus on the process of assessment and evaluation, with some high-level campaign performance indicators.

As noted in Year 2, the UI and NSC assigned dedicated individuals from each organization to develop, adapt, and track the overall progress toward the behavioral theory of change to effectively evaluate the campaign's performance. The public health-based theory (Information Attainment and Adoption Model, Appendix C) in Year 1 continued to serve as the metric to quantitatively and qualitatively measure the campaign's success toward achieving the three broad education outcomes that were directly linked with actions and behaviors.

The broad education goals identified were the following:

1. Increase U.S. drivers' knowledge of active safety features in their vehicles with a campaign focused on how to interact with them appropriately.

2. Reduce crashes, injuries, and fatalities with this knowledge and increased use of defensive driving skills.

3. Encourage drivers to be more active and engaged.

Impression Metrics

As noted in the beginning of the report, the campaign achieved more than six billion media impressions, which far surpassed the original proposal's goal of 2.8 billion media impressions, which also exceeded the stated Settlement of 2.5 billion media impressions. The team made adjustments from the original strategy proposal due to the high cost of advertising and the return on investment. This created a pivot from a strategy focused highly on broadcast and television paid media to capitalizing on earned media opportunities. The campaign's strategy of capitalizing on earned media and having relevant, timely, highly desirable, and sought after information was the key to the success of achieving the overall impression number. The pivot to capitalizing on earned media proved to be instrumental in the overall success of the campaign and achieving the campaign outcomes set out by the team. Noted below are the overall impression numbers by media strategy.

Strategy	Reach (Impressions)
Overall Impressions	**6,025,281,083**
Paid Media	722,762,453
Earned Media	5,172,357,292
Owned Media	977,844
Paid Social Media	129,183,494
Social Media	17,018,996** **Represents impressions within the paid and earned media totals reflected above (are not additional impressions)
Website and Videos	619,567* *Represents unique visitors to the website (Does not reflect additional visits by the same user. Video impressions are reflected within all categories – not reflected in this line item).
Public Service Announcements	11,907,966
Safety Advocate Networks**	**The safety advocate networks impressions are not possible to adequately document, given the presentation style setting, conference networking, and engagement opportunities that include spreading the information of the campaign. Outreach and presentation briefings are documented in Appendix B.

Table 7: Overall Impression Numbers by Media Strategy

This chart reflects the chart listed on Page 10 of the original proposal. "Overall impressions" sum Paid Media, Earned Media, Owned Media, and Paid Social Media. All non-bolded categories reflect categories within the bolded categories (sub-categories).

Campaign Outcomes

The project team not only strived to achieve the Settlement-stated impression metrics, but also identified and developed a list of education outcomes for the campaign to achieve. The team's development process for the education outcomes included identification of how the campaign could work to achieve desired broad education goals and creation of performance indicators for each outcome. Table 8 below reflects the education outcomes and actions and behaviors the team associated with each goal. Each of the four education outcomes in Table 8 supported the three broad education goals (Page 18) identified by the team.

Goal #	Outcome	Specific action/behaviors
No. 1 (Initial)	Seek further information	Increase the number of: • people visiting *MyCarDoesWhat* website • engaged users visiting *MyCarDoesWhat* website • viewing campaign videos • reporting seeking of information behaviors on surveys
No.2	Have more knowledge	Increase the number of people: • correctly answered knowledge questions • returning visitors to *MyCarDoesWhat* website • reporting gain in knowledge on surveys
No. 3	Support and educate others – Audience	Increase the number of people: • reporting having shared or intending to share the *MyCarDoesWhat* website, or on social media with friends/family; • engaging in positive social media conversations (and decreasing in negative conversations)
No. 4	Support and educate others - Partnerships	Increase the number of: • partnerships developed to promote and advance vehicle safety technology • policies implemented with partnerships • testimony, presentations, meetings, conferences
No. 5	Drive better and safer	Increase the number of people: • reporting feeling like a safer driver on surveys

Table 8: *MyCarDoesWhat* Campaign Goals Generated by UI and NSC

After thorough assessment, the team found that the campaign has progressed towards each of the goals noted in Table 8: *MyCarDoesWhat* Campaign Outcomes Generated by UI and NSC. The campaign utilized several data sources to assess the campaign's progress towards the goals and education outcomes, including: surveys, the National Consumer Survey of Driving Safety Technologies, Advanced Vehicle Technology Consumer Survey, Website Efficacy Study, and the established partnerships and collaboration.

Figure 22: Regional market penetration of *MyCarDoesWhat* mass media campaign

Social Media Listening Analysis

During Year 3, the NSC team, along with one UI graduate student, began evaluative efforts on social media listening framework that was built in Year 2. The data from the social media listening served as the analytical basis for the team to evaluate both the performance of the campaign platforms, messaging content, delivery, and overall social media identity, and track conversation trends over time.

Based on the team's social media listening analysis, the team was provided mid-campaign recommendations (Appendix D) to continue to boost impressions and outreach. Recommendations from the analysis included: more press releases, addressing user expectations, further investigate user patterns of the content lists, fix website load time, add and/or revise content to high performance website areas, emphasis on search engine optimization (SEO) and newsletters, and increase shareability (more prominent share buttons). The team used these analytics to increase the success of the campaign mid-year and lay the ground work for future analyses.
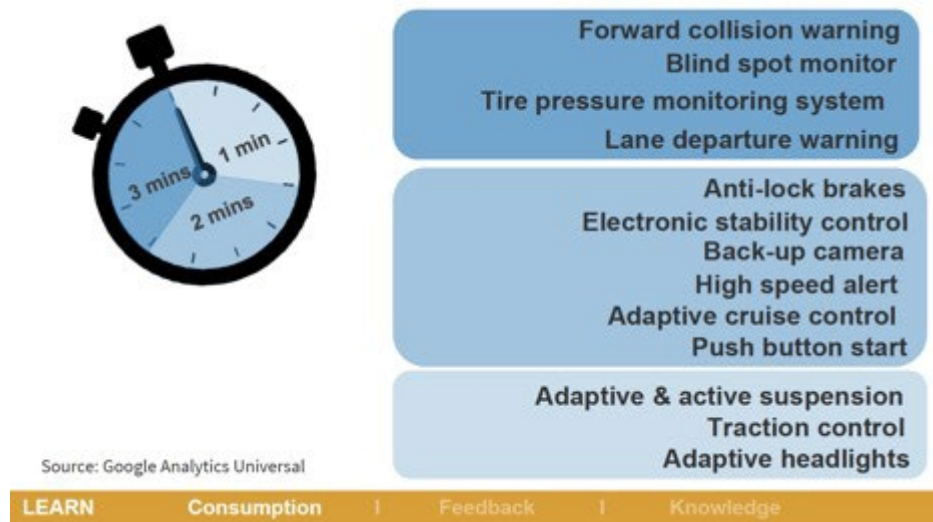

Figure 22: Website technology by visitor exposure

The NSC team utilized the tool, Crimson Hexagon's ForSight, which allows users to aggregate keyword search topics among hundreds of millions of social media posts over time. The team used the tool to track the conversations about crash avoidance technologies from the year prior to and the year after the campaign launch. The listening analysis allowed the campaign researchers to assess how social media conversations were trending and track any reference of the campaign associated with the trends. The evaluation technique allows the team to track consumer questions and con-versations around the technologies to ensure the campaign materials address popular conversation topics and questions. Additionally, the tool and methodology allowed the team to determine what qualified a post as relevant or not relevant to the broader conversation. The tool may pick up conversations that include the name of technology, but not in the context of ADAS technologies or education. The team's methodology of the ForSight tool and how it improved the analysis of the campaign are fully detailed in Appendix E.
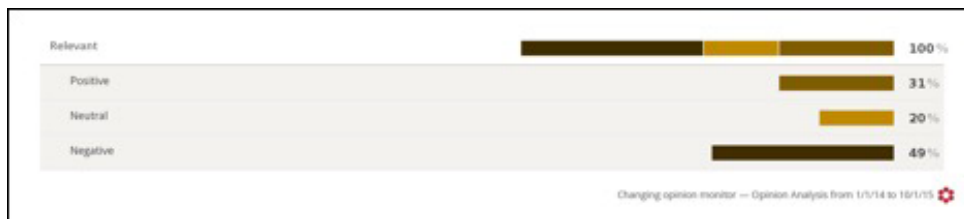

Figure 23: Sentiment in relevant posts in monitor

What's Next?

After close of the grant, the team will continue to use the analytical tools and methodologies that proved invaluable to track progress and assess performance during the life of the campaign. The team will continue to keep a pulse on the key performance indicators that connect to each broad education objective and all education outcome goals to ensure the campaign maintains its relevancy and is addressing the consumer's questions and knowl-edge gaps. The team will continue to release reports on the campaign's overall evaluation program so that other nonprofit and public health types of campaigns can benefit from similar analyses.

The automotive research studies finalized all aspects of the experimental designs. Each study's progress is detailed below and each study's final reports can be found in the attached appendices. All projects were completed on schedule and contributed tremendous knowledge in the transportation and vehicle safety industry. Each project is briefly summarized in Table 9 below. Additionally, each research study's final report is included in Appendices F, G, and H.

University of Iowa Studies and Schedule	YEAR 1		YEAR 2		YEAR 3	
STUDY 1: Emergengy Events in Controlled Environments						
Task 1: Indentify driver, vehicle, traffic scenario	✓	✓				
Task 2: Collect driver performance data			✓	✓		
Task 3: Analize data and write report					✓	✓
STUDY 2: Mitigating UA in Younger and Older Drivers						
Task 1: Syncing of simulator with psychophyiology platform & piloting	✓	✓				
Task 2: Subject cognitive testing			✓	✓		
Task 3: Simulated drives to assess UA			✓	✓		
Task 4: Data, coding, reduction, & analyses					✓	✓
STUDY 3: Understanding the Context of UA: An Engineering Analyses						
Task 1: Indentify vehicle safety systems	✓	✓				
Task 2: Create future vehicle concepts		✓	✓			

STUDY 1 – EMERGENCY EVENTS IN CONTROLLED ENVIRONMENTS

Study 1 sought to perform an in-depth analysis of driver responses to unintended acceleration (UA) events in a driving simulator. In the first year, researchers solely focused on preparation and installation of a new simulator cab. Due to procurement processes and unforeseen developments that were needed to adequately prepare the cab, the researchers delayed data collection and reporting to Year 3. This allowed the team to have a nearly perfected, fully functional, state-of-the-art cab for vehicle simulation.

Upon completion of the new cab installation and prior to the data collection, researchers finalized their experimental design plan. After a thorough review of the UA literature, the team isolated two specific UA events that would be examined in-depth during the study. These two UA events include one that occurs while parking and one that occurs during a left turn. The researchers found in the literature that the majority of the UA events happen during parking or at low speeds during pedal transitions. In Year 2, the team reported they would collect data on three variables; however, the team found that they could collect more robust data by solely focusing on the majority of naturally-occurring event scenarios of Parking and Left Turn Events.
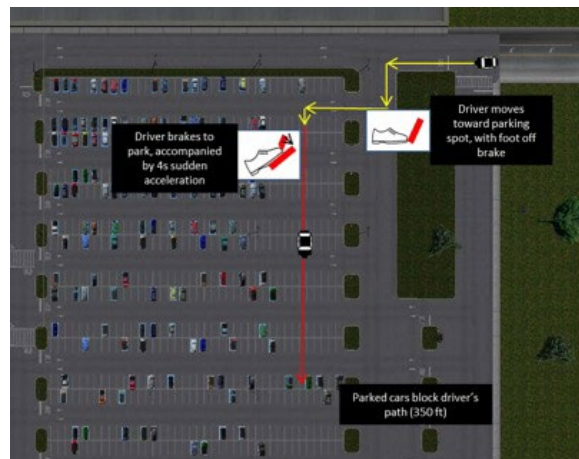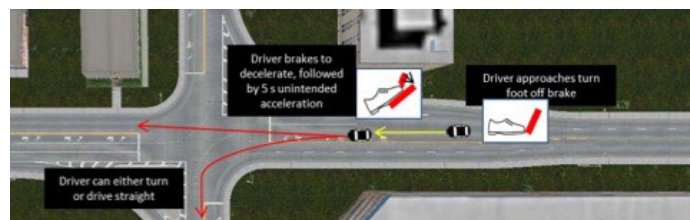

Figure 25: UA Parking Event Scenario

Figure 26: Left Turn Event Scenario

Study 1 Findings

Study 1 included a total of 61 drivers, accounting for 32 Parking and 29 Left Turn Events, respectively. Based on previous literature which shows that older adults, particularly women, are over-represented in UA events and crashes, the team explored the contributions of age and gender in the analyses. The participant group breakdown by events is noted in Table 10 below.

Event A: Parking Event (N=32)			
Young		Old	
Male	Female	Male	Female
N = 8 Age (M) = 29.5 Age range = 21-45	N = 8 Age (M) = 30.6 Age range = 21-45	N = 8 Age (M) = 67.6 Age range = 60-74	N = 8 Age (M) = 69. Age range = 65-79

Event B: Left Turn Event (N=29)			
Young		Old	
Male	Female	Male	Female
N = 6 Age (M) = 32.8 Age range = 26-43	N = 7 Age (M) = 29.4 Age range = 24-40	N = 8 Age (M) = 67.0 Age range = 61-73	N = 8 Age (M) = 67.1 Age range = 62-79

Table 10: Experimental Design and Demographic Information

Driver performance data were analyzed for both the Parking and Left Turn Event Scenarios to provide an understanding of driver response to each event.

Parking Event Findings

For the Parking Event, all drives were video recorded and reviewed by researchers to group subjects according to their response type. The four response types are described below:

• Hard Brake Press: a very sudden and severe depression of the brake pedal, resulting in little acceleration or vehicle travel

• Hard Brake Pump: repeated strong depressions of the brake pedal, resulting in some acceleration and vehicle travel

• Light Brake Pump: a gradual increase in brake pedal force through pumping, not as severe as either hard braking or hard pumping, resulting in some acceleration and vehicle travel

• Light Brake Press: a small initial brake press, followed by either no response or small, brief brake pedal depressions, resulting in the vehicle rapidly accelerating

The researchers found that the likelihood of crashing into another object or vehicle in the parking lot were tied to the type of brake response the driver executed. Overall, researchers concluded that the best response (mitigate a crash) to a UA event in the parking lot was with hard brake press or hard brake pump. All parking events are the driver response is noted in Table 11 below.

	Responses	Crashes
Hard Brake Press	3	0
Hard Brake Pump	9	1
Light Brake Pump	4	0
Light Brake Press	16	8

Researchers observed three distinct paths in the Parking Event Scenario: drivers who stopped quickly without traveling far, drivers who turned left attempting to exit, and drivers who traveled straight and attempted to steer between parked vehicles. Researchers found that young male drivers were most likely to stop the vehicle or steer toward the exit, whereas older female drivers tended to either steer to the exit or steer between parked cars. Further analyses also showed that male drivers tended to respond with more brake force than female drivers, with no significant difference between age groups. Finally, maximum brake force was a strong predictor of crashes, with drivers who braked harder and earlier reaching a lower maximum speed and traveling a shorter distance into the parking lot. Table 12 displays the gender, age, and brake force observed during the drives.
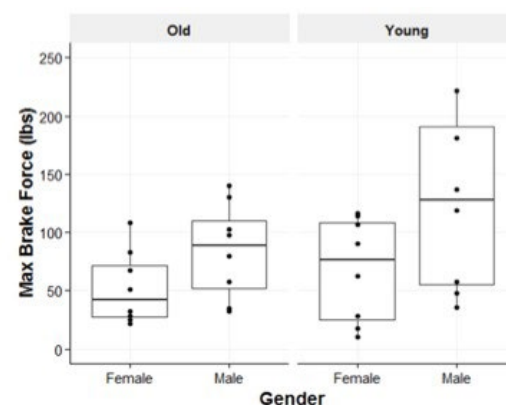

Figure 27. Maximum brake force by age and gender

Table 11: Responses and Crashes by Response Type

Left Turn Event Findings

For the Left Turn Event, all drives were video recorded and reviewed by researchers to group subjects according to two level of response types: brake responses and steering responses, each detailed below.

Brake Responses:

• Hard Brake Press: a very sudden and severe depression of the brake pedal, resulting in little acceleration or vehicle travel

• Hard Brake Pump: repeated strong depressions of the brake pedal, resulting in some acceleration and vehicle travel

• Gradual Brake Press: a gradual increase in brake pedal force, not as severe as either hard braking or hard pumping, resulting in some acceleration and vehicle travel

• Light Brake Press: a small initial brake press, followed by either no response or small brief brake pedal depressions, resulting in the vehicle rapidly accelerating

Steering Responses:

• Sharp Steering: a quick and forceful turn in the steering wheel to attempt to make the left turn

• Gradual Steering: a controlled and gradual turn of the steering wheel to execute the left turn

• Steering Straight: keeping the steering wheel straight while aborting the turn to travel straight instead

Response Type	Stopped in Intersection	Attempted Turn	Aborted Turn/Traveled Straight	Total
Hard Brake	4	0	0	4
Brake Pump	1	2	1	5
Gradual Brake	1	2	4	7
Light Press	0	7	7	14
Total	6	11	12	29

Figure 28: Left Turn observed response totals

Researchers clustered both response types by outcome for analysis. Researchers observed that the majority of crashes only occurred when the driver pressed the brake lightly and steered sharply. All results are detailed in Figure 28 above. Further analyses by age and gender showed no significant differences in braking or speed across age or gender. However, researchers did observe a trend for younger drivers to initiate earlier steering responses and have a higher maximum steering angle.

What's Next?

After the close of the grant, the researchers will continue to refine the experimental design and protocol, as this study laid the foundation for examining and understanding UA. Further studies utilizing the researcher's protocols can collect data on higher speed events, floor mat events, or other variables impacting the pedal and brake. Additionally, the researchers have a total of two journal articles and three conference papers that have been submitted for the study. The researchers will finalize those papers and prepare conference presentations as those results are determined by the journals and conferences. The researchers will continue to conduct data analyses and add to the knowledge base surrounding UA and its application to vehicle safety and human factors.
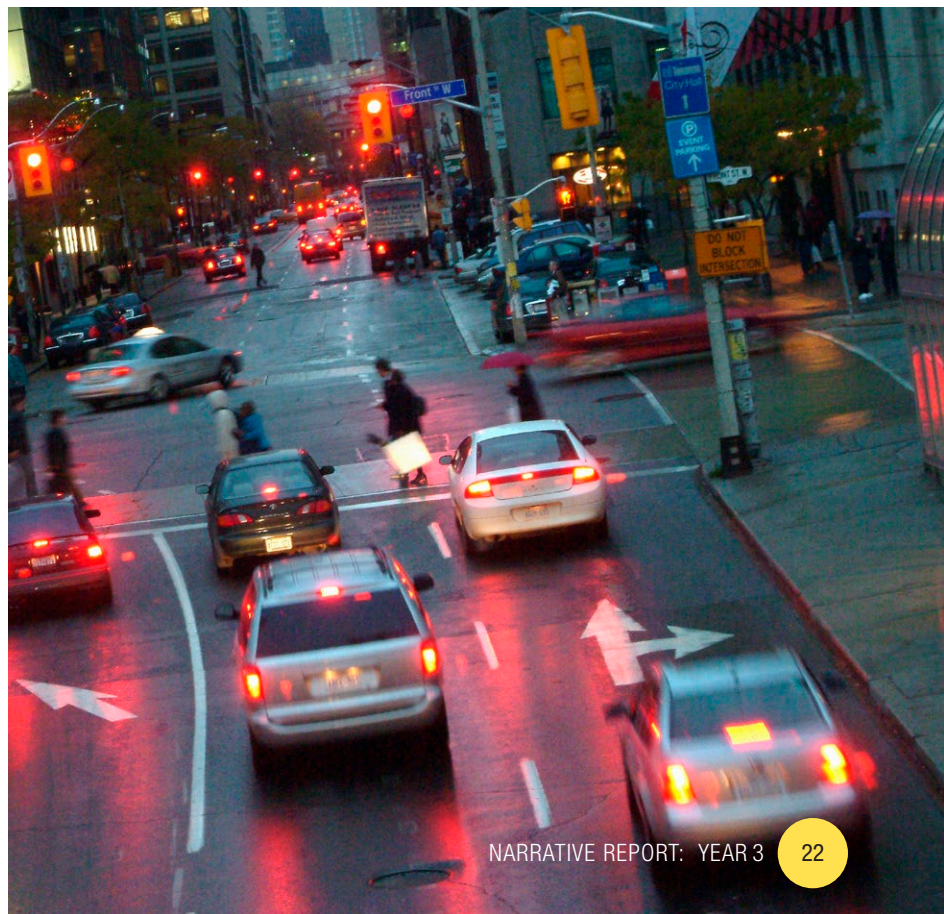
STUDY 2 – MITIGATING UNINTENDED ACCELERATION IN YOUNGER AND OLDER DRIVERS

Study 2 sought to identify key mechanics that contribute to risk at the interface between driver and pedal controls and to mitigate risk and error. Years 1 and 2 were dedicated to developing the study protocols, pilots, and study design. Due to experimental design feasibilities, the team finessed the protocol into Year 2 and dedicated Year 3 to completing all necessary data collection and final reporting.

Study 2 included a total of 138 subjects enrolled that passed the initial screening. Several individuals from all age groups either experienced simulator sickness and were unable to complete some of the driving assessments or were absent during their additional visits, causing a fluctuation in sample size throughout various analyses. However, researchers had adequate data to conduct several analyses.

Study 2 Findings

Study 2 focused on attention and cognitive functions assessments, the demand level of the drive, and distraction and its impact on pedal control. Subjects completed several driving tasks during the study including: car following, lane change, freeway, merges, unprotected left turns, parallel parking, and merging into traffic from parking positions (both angled and parallel positions). All drives were recorded and coded by the research team to assess the pedal control and overall safety. Researchers developed a rubric to assess the pedal control and overall safety with all drives.

Researchers found that older adults differed from younger adults in all measures with poorer performance. For self-reported characteristics, the data showed greater reactivity and impulsively among younger adults (YA) than middle-aged (MA) and older adults (OA), including for qualities of everyday attention.

Researchers found that, in the difficulty demand level of the drive, both younger and middle-aged drivers had poorer lateral control and greater variability in headway maintenance. Researchers also found that, in all three age groups, the subjects increased their average following distance in the more difficult drives.

As indicated in the Year 2 Report, the researchers also collected electroencephalogram (EEG) data during the drives to obtain cognitive load measures. Preliminary findings showed there were some differences in the O1 and O2 electrodes with participants. However, researchers found this to be consistent with the nature of the driving tasks which were "rich" in "visual" stimulation.

Finally, the effects of distraction conditions were examined by the research team. Researchers found that, generally, the level of distraction varied between the different driving tasks. Researchers observed that following distance and headway were minimally affected by distraction in the tasks that required drivers to negotiate curves or change lanes, but were affected in the car following task.

What's Next?

After the close of the grant, the researchers will continue to pursue journal and other publication opportunities of the data. Additionally, the researchers believe the methodology developed by the team can be enhanced in the future to additional populations, driving demand, distraction, and other variables that should be considered when it comes to pedal control. The research team will continue to dive further into the EEG results and assess the results to the driving demand tasks and distraction.
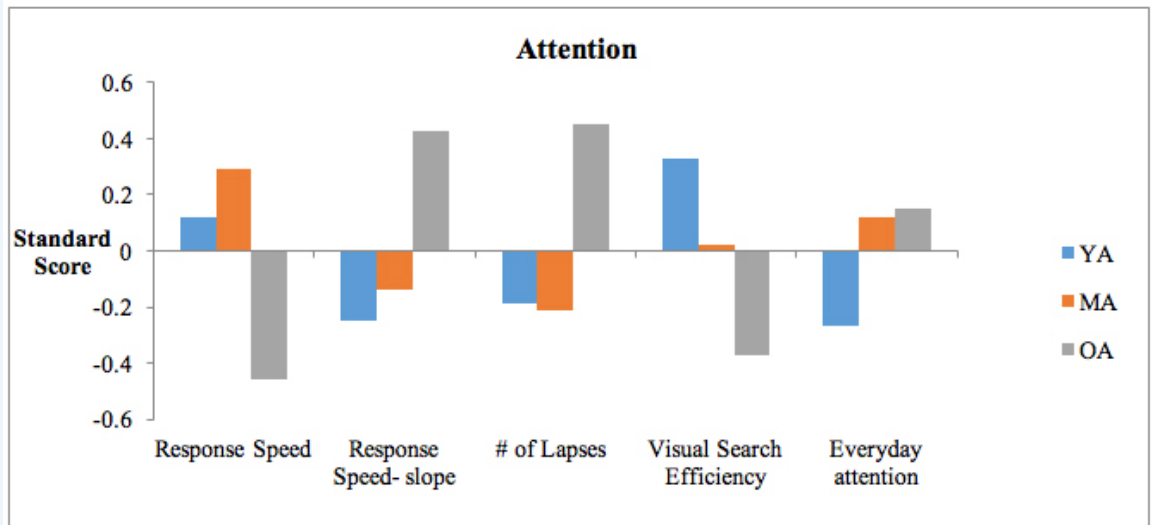

Figure 29: Standard performance scores on attention assessments by each age group

STUDY 3 – UNDERSTANDING THE CONTEXT OF UA: AN ENGINEERING ANALYSIS

Study 3 focused on examining a vehicle's context relative to a sudden UA event. The study focused on examining the issue as an engineering problem and the vehicle's ability to monitor for inappropriate acceleration via technologies like micro-GPS, vision cameras, and sensors. The study utilized naturalistic data (data from real drivers on the road with video and audio recordings from their everyday drives) and test track data (that utilized human subject data in set experimental designs). The naturalistic driving data included a total of 34 participants that had an event data recorder and a forward-facing camera recording in their vehicle for a total of 10 months. Of these participants, 10 were couples living in the same residence. The data focused on the start and end of the participant's drives.

Researchers complemented the naturalistic data with some test track data from the NADS Instrumented Vehicle. This data provided researchers with baseline insights of the range of accelerations and engine speeds from the beginning of an acceleration through its completion.

Study 3 Findings

Previous literature supports that instances of sudden UA are rare in the real world. The naturalistic data did not have any observed instances of sudden UA. Therefore, the goal of the study was to understand the distributions of normal accelerations at different locations and context to provide a baseline for research going forward. The researchers found the joint distributions between time and acceleration and between time and engine speed offer alternative approaches to infer the likelihood that a measured acceleration or engine speed is normal or abnormal at the time the acceleration maneuver was measured. Further analysis concluded that once the acceleration peaks during maneuver, the researchers could assume the driver has released the gas pedal and begun preparing for the next driving task.

Additionally, the study included the analysis of the functional system and layers that could be constructed and provide inputs to a theoretical sudden UA mitigation system. The researchers found that each function of the overall system would use different inputs and contribute to the machine's (vehicle's) overall surrounding environment and make potential decisions to prevent UA events. Each layer of the system is designed to build on itself, with the first layer using signals that are already available to the in-vehicle network (informing the system about the driver). The second layer would use GPS data to understand location and the third layer would include radar and ultrasonic sensors which detect proximity around the vehicle. The fourth layer would add intelligence to the system (learning machine algorithms to predict the likely next action of the driver).
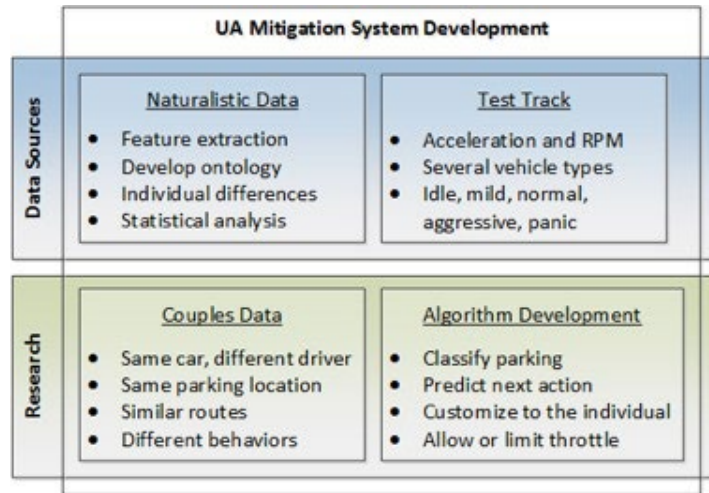

Figure 30: Study 3 activities to understand the context of sudden UA

Figure 30: Functional layers of a theoretical sudden UA mitigation system

What's Next?

After close of the grant, the researchers will continue to utilize the existing engineering analysis and framework to continue to build and understand how to best mitigate sudden UA events. The researchers will continue to submit applicable journal articles on the data analysis that has been completed. Currently, the researchers have one article submission out for a special issue journal.

During data collection, researchers observed several additional analyses and methodologies that could be employed to further mine the data to gain insight on UA events, machine and driver inputs to these events, and mitigating the events in the future. Researchers will continue data analyses and mining upon sustainment of additional funding.

Looking Forward: The Next Chapter

The UI and its partners had an exciting three years in developing and building a National Education Campaign dedicated to inform drivers about critical ADAS technologies that can save lives from the ground up. The UI is pleased to report completion of all major project tasks and project deliverables, including the development of the overall themes and creative strategies of the campaign (Year 1), curriculum materials and interactive media development, website infrastructure and deployment, development of videos, games, applications, and other educational materials, paid media advertisements and PSAs, outreach to earned media contracts, new stories, social media execution, safety advocate network (Year 2), and finally, distribution of the curriculum and outcome analysis (Year 3).

The UI's work is just beginning in the ADAS technologies and vehicle safety realm. The UI and NSC have reached new heights in media for public and national education regarding consumer and driver understanding of ADAS technologies. Driver and consumer understanding of these technologies is imperative to ensure their benefit is translated to the American roadways, which in turns makes our roads safer.

These advanced technologies and higher levels of vehicle automation offer great promise, but only if their safe introduction and deployment is implemented. The UI and NSC see great opportunity for the campaign to expand and enhance consumer education of ADAS technologies, higher levels of automation, and other critical transportation safety issues. The UI and NSC will continue to look for efforts, collaborations, and opportunities to continue to sustain the overall program. After close of the grant, the UI and NSC will reassess and realign the overall campaign goals. The team will look for areas in the transportation and vehicle safety realm that support the overall mission and goals of the programs. The UI and NSC will also seek out partnerships that support the overall mission, goals, and objectives of the campaign.

The UI believes the work is just beginning and the *MyCarDoesWhat* national campaign and brand will play a critical role moving forward to continue to make our American roadways safer for all.
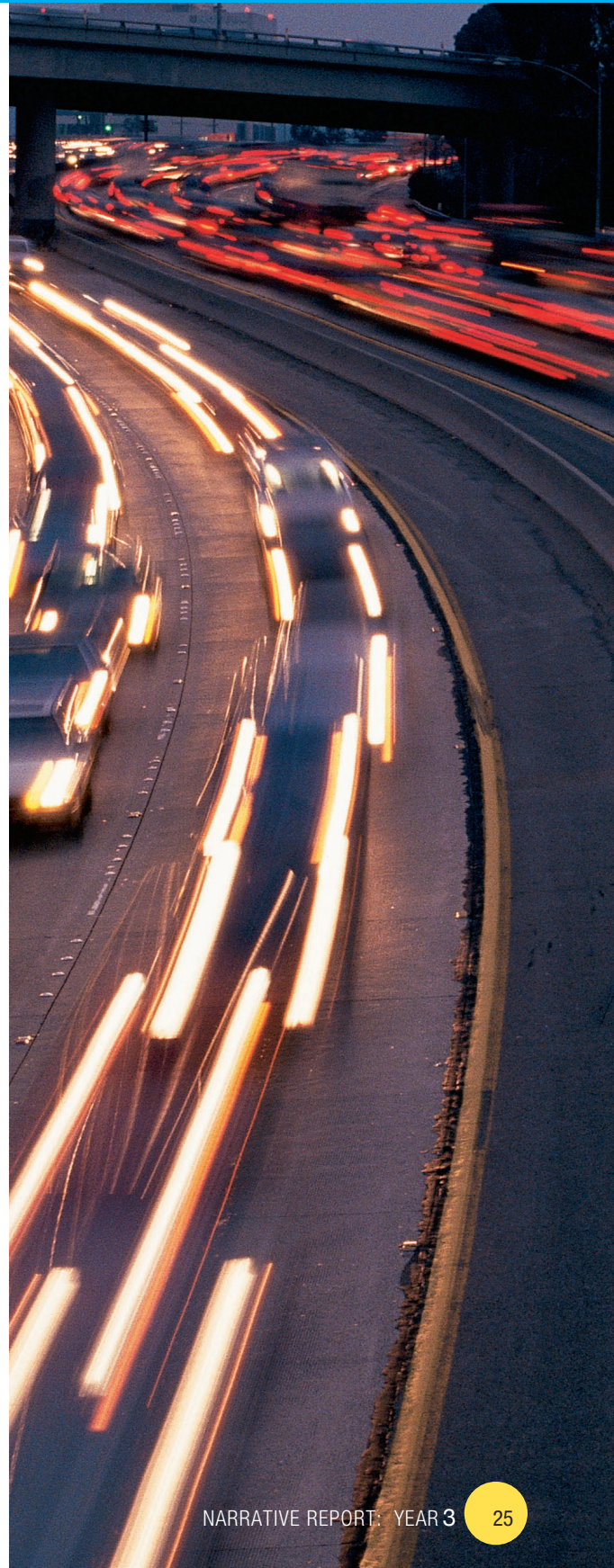
University of Iowa
Transportation and Vehicle Safety

The Transportation and Vehicle Safety Research (TVSR) program works to improve technology design through a better understanding of human behavior and safety system design. The challenge is to match user needs with the optimal solutions—technological or otherwise.

MyCarDoesWhat.org
Know More. Drive Safer.

THE
UNIVERSITY
OF IOWA

Correspondence should be directed to:

Daniel V. McGehee, PhD, Principal Investigator
Transportation and Vehicle Safety Research Program
University of Iowa

2401 Oakdale Blvd, Iowa City, Iowa 52242
Tel. (319) 335-6819
Email: daniel-mcgehee@uiowa.edu

COLLEGE OF ENGINEERING
**National Advanced Driving Simulator
and Simulation Center**
2401 Oakdale Blvd
Iowa City, Iowa 52242-5003
319-335-4683   Fax 319-335-4658
www.nads-sc.uiowa.edu

THE
NATIONAL ADVANCED
DRIVING SIMULATOR