

1 **A CASE STUDY OF TODAY'S AUTOMOTIVE DEALERSHIPS: THE**
2 **INTRODUCTION AND DELIVERY OF ADVANCED DRIVER ASSISTANCE**
3 **SYSTEMS**

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1 ABSTRACT

2 Vehicle manufacturers have developed advanced driver assistance systems (ADAS) to reduce
3 driver workload and enhance safety. The delivery of these systems to a consumer occurs through
4 dealerships not owned by manufacturers. Limited research is available on how dealerships
5 provide consumers with information and training on ADAS. In an exploratory study, semi-
6 structured blind interviews of salespeople at 18 Boston-area dealerships were conducted in the
7 context of potential vehicle purchase across six vehicle brands, seeking information on new
8 safety technologies. While some dealerships are making concerted efforts to introduce and
9 educate customers on ADAS, a number of salespeople interviewed were not well positioned to
10 provide adequate information to their customers. In select instances, salespeople explicitly
11 provided inaccurate information on safety-critical systems. The dealerships sampled representing
12 mass-market brands (Ford and Chevrolet) were the poorest performers. Sales staff at Subaru
13 dealers were well trained and had print and digital content to drive consumer engagements.
14 Educational staff, or “Geniuses,” at BMW dealers present a potentially innovative way of
15 segmenting the sales process from technology education. In the absence of some technology
16 introduction and education at dealerships, consumers may remain under-informed or
17 misinformed about the disruptive safety technologies that are rapidly being introduced across the
18 vehicle fleet.

19

20 *Keywords:* Advanced Driver Assistance Systems, Dealerships, Education, Sales Staff

1 INTRODUCTION

2 Over the past several decades, an industry-wide emphasis on vehicle structure and improved
3 occupant protection during crashes has led to considerable improvements in vehicle safety.
4 These efforts have been highlighted by metrics such as NHTSA's 5-Star Safety Ratings and
5 IIHS's Top Safety Pick. More recently, efforts have transitioned towards the development of
6 Advanced Driver Assistance Systems (ADAS), which are designed to help reduce driver
7 workload, alert a driver to potentially dangerous situations, or assume control of the vehicle in
8 hazardous situations. For example, ADAS such as forward collision warning / mitigation
9 (FCW/M) and autonomous emergency braking (AEB) are capable of mitigating or in some cases
10 even preventing rear-end and other longitudinal based crashes (1). ADAS such as lane departure
11 warning (LDW) and lane keeping assist (LKA) are designed to assist the driver by improving
12 lane keeping (2).

13 Real-world safety impacts of many ADAS are currently ambiguous. Data to clearly
14 establish net positive benefits for LDW / LKA have yet to emerge (3). Another system, Adaptive
15 Cruise Control (ACC), automatically adjusts vehicle speed to keep a set following distance from
16 a leading vehicle, relieving drivers from having to continuously brake and reset cruise control (or
17 manage speed and headway) when a vehicle in front of them decelerates. Though marketed as a
18 convenience feature rather than a safety system, ACC use has shown positive safety benefits in
19 the form of increased vehicle headway (4,5) and fewer forward collision warnings (4). Yet
20 research suggests that the use of ACC increases both response times in a hazard detection task
21 (6) and risk of colliding with stopped vehicles versus manual driving (7). Multiple studies have
22 indicated that potential risks associated with ACC use may be due to users' unawareness of how
23 ACC works and of system limitations (7-9).

24 Unfortunately, many drivers with ADAS inaccurately understand the operating
25 characteristics of systems (10). Consequently, drivers may trust systems to intervene in situations
26 beyond what said systems are designed to handle. Examples include classic radar-based ACC
27 systems failing to brake when encountering a fully stopped vehicle (11) or Tesla's Autopilot
28 failing to respond to a vehicle parked partially in the travel lane (12). Some ADAS that only alert
29 the driver of a potential issue, such as LDW, may seem more intuitive than active systems like
30 ACC or Autopilot. However, a simulator study exploring mental model development of LDW
31 systems found that only 16.7% participants understood that, like real-world LDW systems, the
32 simulated LDW system was only operational above a certain minimum speed (13). This could
33 indicate that real-world drivers trust LDW or even LKA to intervene at low speeds, when in
34 many systems they only work above a minimum threshold. The dangers associated with these
35 limitations are compounded by drivers' initial confidence in their understanding of a system,
36 which makes it unlikely they will seek out details on the manufacturer's recommendations for
37 proper use. Instead, drivers often depend on a combination of observed system characteristics
38 (positive and negative experiences) to develop functional mental models.

39 This method of "experiential" learning may not be optimal. While studies show that with
40 extended use, drivers are more likely to be aware of system limitations and change their driving
41 behavior accordingly (14), the increasing complexity of vehicle technology could easily make
42 the average driver a "novice," for an extended period as they confront unforeseen use conditions
43 throughout a product lifecycle. ADAS and other automated driving features have use limitations
44 or restricted operational design domains (ODD), which may further vary by brand and model.
45 For example, ACC can fail to work in a number of everyday scenarios, including heavy rain or
46 fog, when dirt, snow, or ice cover the sensors, while driving around curves, with small vehicles

1 such as motorcycles, or possibly when confronted with a stopped or slow-moving vehicle (*15 my*
2 *car does what*). To what extent can one reasonably expect a “typical” driver to become educated
3 in these myriad use conditions and details?

4 Multiple studies have found that consumer education is most often self-directed, and can
5 lead to gaps in functional understanding of systems (*11*). Vehicle manuals or trial and error are
6 the most commonly reported methods of learning to use safety systems, and formal dealership
7 education occurs far less often (*10,16*). In many instances, drivers are not made aware of the
8 ADAS installed in their vehicles or what features are available to them at the point of purchase.
9 As such, drivers may be unaware of a potentially beneficial system available for purchase or
10 installed in their vehicle, and thus fail to take advantage of its features (*17*). Even dealership
11 salespeople, who one might expect to be knowledgeable about vehicle capabilities, can
12 themselves be unaware of technology in a given vehicle. For example, a Volvo dealership
13 demonstration of a self-parking feature resulted in injury to two bystanders when a salesperson
14 thought the vehicle would stop before hitting the onlookers (*18*). The vehicle lacked pedestrian
15 detection. A salesperson’s inability to educate consumers on appropriate use of technology in
16 their vehicle may result in ineffective or insufficient use and potentially negate the positive
17 effects of these systems.

18 Perhaps automotive dealerships, the key human-to-human connection point in the
19 automotive purchasing process (*19,20*), can play a more substantive role in the introduction and
20 encouragement of consumers to safely adopt new potentially lifesaving safety technologies. The
21 enhanced NCAP 5-Star Safety Ratings, proposed expansions to the Monroney sticker, and
22 educational efforts such as My Car Does What (*15*), represent important steps in providing the
23 public with key information on safety technologies; however, without active, informed support
24 and translation during the salesperson’s interaction with the customer, the full potential of these
25 resources may not be fully realized. If there is not good alignment between these sources and the
26 interaction that takes place between the prospective buyer and the sales force, it is possible that
27 customers may leave the dealership less effectively educated, and perhaps more confused, than
28 when they entered.

29 It is important to note that dealerships are not owned by manufacturers. They are
30 independently owned and financed businesses. Dealerships act as the distribution channel for
31 manufacturer products. Typical dealer functions include: selling vehicles, providing information
32 to the customer, handling parts and inventory, handling service and warranty, and a variety of
33 other functions in support of the manufacturer. These additional functions may include training
34 employees as required or recommended by the manufacturer or facilitating employees’
35 attendance at manufacturer sponsored training events. Manufacturers frequently have limited (if
36 any) direct control over the performance of sales staff on issues around technology introduction
37 and education, key components of the sales, vehicle delivery, and post-delivery processes.

38 It is commonly believed by many within the safety research community that customers
39 often leave dealerships without knowing what systems are in their newly purchased vehicle or
40 how each system works. As a result, a number of authors have suggested that dealerships need to
41 improve their customer training on new in-vehicle technologies (*21-24*). The Department of
42 Transportation recently addressed the importance of thorough consumer training as automated
43 vehicles become prevalent (*25*). Yet in many cases, it is not clear what information and training
44 customers are currently offered at dealerships before or after vehicle purchase. A pilot
45 observational study exploring the customer experience at dealerships, salesperson training, and
46 customer interest in ADAS was developed in order to explore salespersons’ introductions of

1 safety technologies to the customer and elicit possible deeper insight on customer education.

3 **METHODS**

5 **Study population**

6 Salesperson interviews were undertaken at high-volume dealerships in the greater Boston area.
7 In order to explore differences between companies, researchers visited dealerships representing
8 luxury, mass-market, and “safety-focused” brands. Since this study specifically examined safety
9 technologies, it was hypothesized that more overtly safety-focused brands would invest more in
10 introducing consumers to safety technologies than luxury or mass-market brands.

11 Companies were chosen for inclusion based upon sales volume in the United States
12 within their category. Ford and Chevrolet represented the mass-market category, Volvo and
13 Subaru the safety category, and Mercedes-Benz and BMW the luxury category. Three
14 dealerships were visited for each individual manufacturer, which created equally balanced safety,
15 luxury, and mass-market categories. In total, 18 dealerships were visited. All salespeople
16 provided post-hoc consent as required by MIT’s Committee on the Use of Humans as
17 Experimental Subjects. Salespeople were offered the opportunity to withdraw their data from the
18 study at the end of each interview, and were provided with contact information should they have
19 any follow-up questions or choose to withdraw after the research team had left, but none opted to
20 do so.

22 **Procedure**

23 Two research associates (lead authors) visited each dealership together posing as individuals
24 early in their car-purchasing journey and seeking more information on new safety technologies
25 in the manufacturer’s vehicles. Dealerships were visited during slow periods in order to prevent
26 salespeople from feeling undue pressure to make a sale due to the presence of other customers or
27 monthly quotas.

28 Semi-structured blind interviews focusing on select technologies (Table 1) were
29 conducted with the first salesperson that approached the research team or with the salesperson
30 that was assigned to the team by the dealership receptionist. All of the technologies listed were
31 available in vehicles offered by each manufacturer in the sample. Researchers first asked for an
32 overview of the most advanced safety technologies offered by the manufacturer by saying,
33 “We’re starting to look at cars and safety is really important to us. We’ve noticed there are a lot
34 of new safety technologies that are being introduced in vehicles. Can you tell me more about the
35 new advanced safety technologies in your cars?” Since the question was open-ended, salespeople
36 occasionally provided information on additional technologies. The team did not ask about a
37 specific vehicle to increase the likelihood that the salesperson would focus on the safety
38 technologies, rather than other sellable features of the car, such as fuel efficiency or cost. After
39 the initial overview, researchers followed up with questions about specific technologies from
40 Table 1 that were not mentioned or clearly explained using the following phrasing: “We saw a
41 commercial/read online that there’s a technology where (*insert description from Table 1*). Can
42 you tell us more?”

1 **TABLE 1 List of Advanced Driver Assistance Systems and their Function**
 2

Name	Zone	Function of System (13)	Description Given to Salesperson
Adaptive Cruise Control (ACC)	Forward	Automatically speeds up and slows down your car to keep a set following distance relative to the car ahead. Provides some braking.	“When you’re using cruise control, the car changes its speed.”
Automatic Emergency Braking (AEB)	Forward	This feature can sense slow or stopped traffic ahead and urgently apply the brakes if the driver fails to respond.	“The car will stop itself if it thinks you’re going to hit something in front of you.”
Blind Spot Monitors (BSM)	Lateral	Uses a symbol, sound or vibration to let the driver know there are vehicles located in their blind spots.	“The car tells you if you try and change lanes and someone is in the lane next to you”
Forward Collision Warning (FCW)	Forward	Forward collision warning can alert you of an impending collision with a slower moving or stationary car in front of you.	“The car will beep and/or flash a light if it thinks you might hit something in front of you.”
Lane Departure Warning (LDW)	Lateral	Lane departure warning systems alert you if you’re drifting out of your lane using visual, vibration or sound warnings.	“The car tells you when you’re moving out of the lane.”
Lane Keeping Assist (LKA)	Lateral	May gently steer you back into your lane if you begin to drift out of it.	“The car won’t let you leave your lane, it kind of pushes you back.”

3
 4 After all technologies were explained thoroughly or once the researchers felt the
 5 salesperson had no additional information to offer, the team revealed they were present as part of
 6 a research study exploring how in-vehicle technologies are introduced to consumers. Salespeople
 7 were provided with a debriefing statement that thoroughly summarized the study, offered the
 8 option to withdraw their data from the sample, and provided contact information for any follow-
 9 up questions. After the debrief, researchers asked the following additional questions:

- 10
 11 1. Do customers ask about safety technologies?
 12 2. What type of training did you get?
 13 a. How often do you go through training?
 14 3. Do you teach customers how to use the systems when they buy a car?
 15 a. How long does that take?
 16 b. Do customers call back with questions after they leave?
 17

1 Once all questions were answered, salespeople were offered their choice of \$20 gift card to either
2 Amazon.com or Dunkin' Donuts.

3

4 **Analysis**

5 Since salespeople were not told the true intention of the visit until mid-way through each
6 interaction, the interviews were not audio recorded. Instead, immediately following each visit the
7 researchers thoroughly documented the interaction by writing down the extent to which the
8 salesperson was able to describe the technologies, any inaccurate information provided on a
9 system, and the salesperson's responses to the post-debrief questions. To help reduce the
10 influence of individual impressions, researchers only recorded and analyzed points on which
11 both research associates agreed took place and interpreted in the same way.

12 After all dealerships were visited, the researchers identified opinions, views, and
13 strategies for ADAS presentation and training within manufacturer category and within
14 individual manufacturers. Coding focused on objective factors, e.g. frequency of training, rather
15 than subjective factors, e.g. rapport between a researcher and the salesperson. Some notable
16 subjective factors were included in the results where they affected the sales and education
17 experience at that dealership.

18

19 **RESULTS**

20 Salespeople were categorized into three groups depending on the quality of the explanation of
21 safety technologies they provided: "thorough," "satisfactory," and "poor." Explanations
22 classified as "thorough" indicated the salesperson explained all of the technologies of interest
23 with little or no prompting from the research team, and provided examples of ways in which
24 some systems could fail. "Satisfactory" explanations indicated most of the technologies were
25 explained, but with some prompting. "Poor" explanations indicated many of the technologies
26 were not explained and the salesperson needed significant prompting before discussing any
27 specific technology. One salesperson did not give any explanation of the systems, and refused to
28 speak with the team unless they were planning to purchase a car in the very near future. This
29 salesperson was separately categorized under "No Explanation." Since no relevant information
30 was provided, data from this salesperson was excluded from further analysis.

31 Six of the 17 salespeople who assisted the research team were able to provide a
32 "thorough" explanation of the safety technologies. Seven salespeople gave "satisfactory"
33 explanations, and four gave "poor" explanations. Two salespeople gave explicitly incorrect
34 safety-critical information regarding at least one system; one salesperson said Pedestrian
35 Detection was active at all speeds when it appears according to manufacturer specifications to
36 function only above 30mph. Another salesperson incorrectly stated an individual did not have to
37 use their brake when operating a self-parking feature, while the specifications note the driver
38 does. Five of the six salespeople who provided "thorough" explanations of the technologies
39 described their own training as consisting of extensive and continuous web-based and hands-on
40 training. The four salespeople who provided "poor" explanations described their training as
41 primarily web-based, and did not describe any structured hands-on training. One salesperson in
42 the "poor" category said he did receive hands-on learning, but with probing, it became clear he
43 was referring to occasions where he pulled a vehicle from the lot and drove it up to the
44 dealership entrance so a customer could go for a test drive.

45 The data exhibited clear differences between luxury, safety, and mass-market brands in
46 terms of introductions to, and explanations of, ADAS (Table 2). Generally, safety brands gave

1 “thorough” explanations of the technology, luxury brands gave “satisfactory” explanations, and
 2 mass-market brands gave “poor” explanations. Both individuals who provided incorrect safety-
 3 critical information were in the “poor” category and from mass-market dealerships.

4
 5 **TABLE 2 Level of Safety Technology Explanations by Dealership Category**

	Thorough	Satisfactory	Poor	No Explanation
Safety:	4	2	0	0
Luxury:	1	4	0	1
Mass Market:	1	1	4	0

7 *Cell values represent the number of dealerships*

8
 9 **Luxury Brands**

10 BMW and Mercedes dealerships composed the luxury brand sample. One Mercedes salesperson
 11 refused to speak with the team unless they were planning to buy a car in the very near future. As
 12 stated previously, this salesperson has been excluded from further analysis. With the exception
 13 of this salesperson, luxury salespeople placed a larger emphasis on maintaining a congenial
 14 customer relationship than other dealerships. Luxury salespeople usually fell into the
 15 “satisfactory” explanation category (Table 2). They were able to give a general description of
 16 what most safety systems did and how they operated, but relied on research staff questions,
 17 websites, or videos to trigger them to discuss a system or explain the system rather than being
 18 able to provide the information themselves. They also did not typically provide examples of
 19 system limitations or proper use conditions for each system (Table 3).

20

1 **TABLE 3 Technology Explanations by System & Dealership Category**
2

Category	System	Described	Needed prompt	Gave incorrect safety-critical information	Provided use conditions
Luxury*	ACC	4	3	0	1
	AEB	5	2	0	1
	BSM	5	3	0	1
	FCW	5	3	0	1
	LDW	5	3	0	1
	LKA	4	3	0	1
<i>Average systems per Luxury dealership:</i>		5	3	0	1
Safety	ACC	6	0	0	4
	AEB	4	0	0	4
	BSM	6	0	0	4
	FCW	4	0	0	4
	LDW	6	0	0	4
	LKA	6	1	0	4
<i>Average systems per Safety dealership:</i>		5	0	0	4
Mass Market	ACC	4	3	0	1
	AEB	4	1	1	3
	BSM	3	2	0	1
	FCW	3	2	0	1
	LDW	4	3	0	1
	LKA	3	2	0	2
<i>Average systems per Mass Market dealership:</i>		4	2	0	2
<i>Average systems in sample**:</i>		5	2	0	2

3 *Five dealerships included in Luxury sample

4 **17 dealerships included in analysis

5 Counts represent the number of dealerships

6
7
8
9
10
Luxury car salespeople were the most likely to discuss how their brand was different from other manufacturers on the market. They discussed the brand more than the function of the technology; when bringing up a system, they would briefly describe what it did, but made sure to mention that their manufacturer either developed the technology or enhanced it in some way.

1 Salespeople also focused on presenting a “luxury vehicle” rather than describing a “safe
2 vehicle.” Most ADAS, though referred to by the research team as safety systems, were framed as
3 convenience or luxury technologies by the sales staff. For example, explanations of a systems
4 such as LKA, focused on how “cool” or “interesting” it was, rather than the efficacy of the
5 technology or the potential for increased safety.

6 Follow-up discussions showed that BMW dealers have developed a delivery system that
7 does not require salespeople to introduce customers to the vehicle post-purchase. BMW trains a
8 group of staff members on all technologies in each vehicle. These staff members run a “Genius
9 Bar” in the dealership. “Geniuses” are responsible for training customers on the vehicle at initial
10 delivery, hold follow-up appointments whenever customers need refresher sessions, and field
11 ongoing customer questions relating to the vehicle technology. Interestingly, salespeople said the
12 Genius Bar was available for anyone who had a question on BMW technology. For example, if a
13 person were to walk into a dealership and ask questions related to technology alone, they would
14 be directed to a Genius. Research staff, however, were never directed to a Genius.

15 16 **Safety Brands**

17 Volvo and Subaru dealerships composed the safety brand sample. These dealers generally gave
18 “thorough” explanations on the technology (Table 2). Safety dealerships often described all of
19 the systems without prompting, and were most likely to provide use conditions for each system
20 (Table 3). All safety salespeople noted receiving quarterly web-based training as well as yearly
21 hands-on training with new vehicles and features. Hands-on training typically included a
22 classroom session with a description of the new vehicle, followed by test drives and / or
23 demonstrations of new systems in action. For example, salespeople described hands-on sessions
24 where inflatable cars were used in place of actual parked vehicles to fully demonstrate AEB or
25 self-parking features. Salespeople said the hands-on portion of the training was helpful, as it
26 allowed them to experience features for themselves and left them more prepared to pass that
27 knowledge along to the customer.

28 All safety dealers described thorough customer training before and after purchase.
29 Delivery of the vehicle was said to take approximately 1-1.5 hours. Salespeople noted that most
30 customers either returned to the dealership or called with questions after delivery. While all
31 salespeople representing both safety brands undergo similar training structures, the presentation
32 of ADAS differed significantly between the two brands.

33 34 ***Volvo Technology Presentation***

35 Volvo salespeople tended to discuss the structural integrity of the vehicle and injury or fatality
36 reduction rather than new safety technologies, even when asked for information about specific
37 systems. One salesperson provided only a brief overview of the structure of the vehicle before
38 moving on to a comprehensive discussion of the active safety technologies. The two other
39 salespeople discussed physical safety systems at length (e.g., collapsible steering columns, roll-
40 cages, crumple zones, metals alloys, etc.) and only moved on to active safety technologies after
41 extensive prodding by the research team. While these two salespeople had a functional
42 knowledge of what the technologies did and how they worked, they openly represented
43 themselves as uncomfortable with the driver being relieved of control and expressed a dislike for
44 the systems. They also emphasized that each technology would be part of expensive additional
45 packages, yet did not definitively state which systems were in which package.

1 Importantly, each salesperson brought up Volvo’s Vision 2020 initiative, which set the
2 goal that no one be seriously injured or killed in a new Volvo car (26). Corporate Volvo has been
3 advertising IntelliSafe, a marketing tool describing a suite of advanced safety systems, as crucial
4 for meeting this goal (27). However, no salespeople interviewed mentioned IntelliSafe
5 specifically. Salespeople were more likely to discuss physical safety systems as critical to
6 meeting Vision 2020 goals.

7 8 ***Subaru Technology Presentation***

9 When prompted with the safety question, every Subaru salesperson immediately launched into a
10 description of EyeSight, a package that Subaru has developed consisting of ACC, LDW, pre-
11 collision braking, & pre-collision throttle management. Each salesperson mentioned that all 2017
12 Subaru vehicles come standard with rear vision cameras, and are capable of having BSM, lane
13 change assist, and rear cross traffic alert. To assist with their description, salespeople either used
14 an EyeSight brochure or an in-dealership tech display. These were touch-screen systems that
15 allowed customers to watch videos or read descriptions about how different technologies
16 (including safety systems) in the vehicle functioned. Similar to Subaru’s website and brochure
17 information, an entire section on the touch-screen displays focused on EyeSight, the technologies
18 included in the package, their benefits, and limitations to each technology. When discussing
19 EyeSight and other systems, salespeople did not rely on the supplemental materials, but rather
20 used them to augment the explanations they provided.

21 At delivery, consumers are reportedly taught not only how to use their EyeSight system
22 and its limitations, but also how to care for it. Special instructions are given as to how placing
23 items or stickers on the window or dashboard and how to clean the windshield to ensure cleaning
24 solutions do not spray on the EyeSight cameras and obstruct their view. Finally, a brochure
25 separate from the vehicle manual concisely summarizes each point the salesperson describes at
26 delivery.

27 28 **Mass-Market Brands**

29 Chevrolet and Ford dealerships represented the mass-market sample. While not all of the
30 vehicles offered by these manufacturers have every safety system, the manufacturers did offer
31 each system of interest in multiple vehicles. Mass-market salespeople typically gave “poor”
32 descriptions of systems (Table 2). While most mass-market salespeople attempted to provide a
33 description of one or two technologies, some followed their descriptions by saying a description
34 of all systems was not possible or advising the research team to look online. In lieu of technology
35 descriptions, several sales representatives focused on IIHS ratings and airbags.
36 While attempting to answer the team’s questions, a few salespeople provided inaccurate
37 information on the functionality of systems (Table 3). For example, one Ford salesperson stated
38 that Pre-Collision Assist with Pedestrian Detection would prevent collisions at all speeds and did
39 not provide any information on capability limits. In contrast, the user manual (28) indicates that
40 these systems will not detect pedestrians when traveling above 50mph, will not detect cyclists,
41 pedestrians, or animals at night, or operate reliably in cold, snowy, icy rainy, or foggy weather.
42 One Chevrolet salesperson brought up Automatic Park Assist, and incorrectly stated a driver did
43 not need to operate the brake when using the system. As Automatic Park Assist was not one of
44 the systems on the initial interest list, this error was not included in Table 3.

45 Salespeople estimated that delivery of a vehicle takes approximately 15-30 minutes. They
46 explicitly commented that the safety systems are intuitive and customers do not need to call back

1 with questions. One salesperson said he recommends all of his customers keep every system on
2 the factory default settings, rather than customizing to their preference. Importantly and
3 somewhat unsurprisingly, mass-market salespeople described a customer relationship very
4 differently from luxury and safety brand salespeople. Salespeople said customers do not come in
5 with questions or to shop around, but to negotiate price only.

6 A Ford corporate trainer was present while the research team visited one Ford dealership.
7 The trainer informed the team that if a Ford dealership was not selling high volume, they do not
8 get training on the vehicles. Other mass-market sales representatives confirmed they did not
9 receive hands-on training, and learned how the systems worked by driving them up to the
10 dealership entrance when a customer wanted to go for a test drive. It is important to note that
11 many of these systems only activate at speeds over 25mph.

12 One Chevrolet salesperson did give a “thorough” explanation of the vehicle systems. This
13 salesperson had undergone a training curriculum similar to that of safety dealerships, but it is not
14 clear why he received this training when no other mass-market salespeople had. He described
15 visiting a location where the systems were explained and said he had the opportunity to take the
16 vehicle on a test track to experience them first-hand. In the entire sample (safety and luxury
17 included), this individual gave the most thorough description, including not only situations in
18 which each system would fail to operate but including distances at which radar systems, such as
19 ACC, were effective.

20 21 **DISCUSSION**

22 The study found that many salespeople interviewed failed to provide consumers with what might
23 be considered adequate descriptions of available safety technologies. Some dealers are aware of
24 the need for technology training and appear to be taking steps to educate consumers during the
25 sales information gathering process and/or at vehicle delivery. These steps may include extensive
26 sales staff training, developing clear marketing materials on safety systems for consumers, or
27 providing the opportunity for follow-up customer training. Salespeople who had gone through
28 extensive training from the manufacturer were able to provide more thorough explanations.
29 Salespeople who had not received hands-on training were less capable of describing the
30 technologies, and in select cases, provided inaccurate or misleading safety-critical information.
31 Salespeople in mass-market dealerships in particular did not appear well incentivized or trained
32 to properly teach their customers how to use safety systems. It is plausible that self-selected
33 consumer preferences for lower cost vehicles provides a disincentive for sales staff at mass-
34 market dealerships to learn how to describe systems that are often only available through costly
35 add-on packages.

36 A few dealerships, especially those aligned with companies who have a safety-centric
37 focus, have implemented steps to facilitate customer education on these technologies. Subaru, in
38 particular, has created supplemental materials at every stage of the car-buying process to help
39 customers understand what technologies are available, how they work, and how to purchase
40 them in their vehicle. Salespeople at Subaru appear to be continuously and thoroughly trained to
41 discuss these systems with customers, and have a clear understanding not only of how systems
42 work, but how to educate their customers about these systems. Many of the salespeople noted
43 that training on all systems in one day is not possible and overwhelms the customer. The
44 availability of follow-up training may be essential to ensuring that owners are given long term
45 opportunities to become aware of, and develop an understanding of, proper use of the
46 technologies in their car.

1 The BMW dealerships also seem to be focusing on technology training by implementing
2 their Genius Bar, a strategy that may have been drawn in part from other well-known tech-
3 focused companies. Overall, the conceptualization that vehicle delivery and technical questions
4 are the primary responsibility of a dedicated department rather than a subset of a salesperson's
5 myriad responsibilities appears as a well-conceived innovation in the car purchasing model. It
6 would not be surprising if BMW owners received a greater level of training at and after delivery
7 if the Genius Bar model is fully implemented as described. However, in the absence of direct
8 referral of the interviewing staff to the BMW Genius Bar in the course of this study, the authors
9 cannot comment on the basis of actual experience about the utility of this model.

10 Significant follow-up questions were required with many salespeople in luxury and mass-
11 market brands to extract safety-related information. For this reason, we believe that in many
12 cases, only customers who come into dealerships with pre-existing knowledge about safety
13 systems, and actively ask system-related questions, may receive reasonable description of these
14 new systems, especially prior to delivery. Inconsistent or vague information may leave
15 consumers with only cursory knowledge of systems, or worse, may leave them more confused
16 than they were when entering the dealership. Confusion regarding such systems, combined with
17 their added price, may de-incentivize the purchase of safety packages. Much like failure to
18 purchase a system due to lack of customer interest or vague salesperson description, failure to
19 use a system or uncertainty around how and when to properly use it could limit safety benefits.

20 It is quite possible that as more customers become aware of ADAS and enter dealerships
21 asking for information about availability of systems, salespeople will become more prepared to
22 provide comprehensive descriptions of the capabilities and limitations of systems during the
23 sales process. However, current gaps and failures in sales staff knowledge will need to be
24 addressed so that they are fully prepared to meet consumer requests with accurate information,
25 and to avoid situations, such as the two cases in this study, where inaccurate information about
26 system capabilities were presented. While lack of information may influence consumers to forgo
27 the technology altogether, promising a system will be effective in situations where it is not, or
28 inaccurately indicating that drivers can completely rely on the technologies under all conditions,
29 may lead consumers to place undue trust in the technologies. In turn, this could cause drivers to
30 be less vigilant and respond more slowly to potential hazards than they would have without the
31 technology, possibly negating any potential benefits the system is capable of delivering. A
32 salesperson's primary responsibility is to sell cars, rather than educate the consumer; however,
33 intentional or not, promising system functionality beyond that which it is capable of delivering is
34 not an appropriate or safe method for car sales.

35 Mass-market dealerships, the poorest performing of all dealerships in this study, could
36 become "thorough" educators with proper training. Most of the salespeople in mass-market
37 dealerships described little to no training, and, as noted earlier, even a Ford corporate trainer
38 indicated that only high-volume dealerships are provided with salesperson training. Since
39 researchers in this study visited only high-volume dealerships, lower-volume dealerships might
40 be expected to perform even worse than those in this analysis. The only salesperson at the mass-
41 market level that provided a thorough explanation was also the only salesperson in the mass-
42 market category to report having received both extensive web-based and in-person training that
43 paralleled that of the safety brands. It is also fair to note that many customers have not
44 historically used mass-market salespeople as substantive informational resources. Many
45 customers do all their research independently, before entering a dealership, and interact with a
46 salesperson largely to negotiate price. Up until relatively recently, the salesperson has not needed

1 to fully understand how technologies worked since drivers largely interacted with such
2 technologies in a passive manner and there were few technologies to consider as purchasing
3 options. As this study found, mass-market salespeople are most often the individuals training
4 customers on systems in their new vehicle. As ADAS systems of the type discussed here become
5 more common, salespeople will need to be adequately trained and incentivized in order to serve
6 as consumer educators, or the mass-market delivery model will need to change so that
7 individuals who are properly educated will provide accurate consumer training during delivery.

8 Findings across the mass-market brands raise a number of concerns, given the level of
9 attention being placed on the development of automated driving features, the standardization of
10 AEB across all vehicles sold in the U.S, and the potential for increases in risk stemming from
11 improper use of ADAS (7-9,12). These results suggest that the mass-market automotive delivery
12 system may require reengineering to place a greater focus on the delivery of accurate information
13 about automotive technologies. In short, as automation technologies have long been known to
14 require higher levels of user education for successful operation, the high tech nature of today's
15 automobile requires considerably more in-depth introduction and education than appears to be
16 currently offered in the mass-market dealers visited.

17 **CONCLUSIONS**

18 Though this study was exploratory, our results suggest future research should focus on the state
19 of vehicle technology introduction and driver training. Future work would benefit from sampling
20 across a wider geographical range and a more diverse set of manufacturers and dealerships. With
21 a larger sample, correlations between customer education and differences in salesperson
22 compensation (e.g., commission vs. salaried staff) might be examined. Along similar lines,
23 relationships between customer education and staff turnover rates at dealerships, individual
24 salespeople's trust in technology, or purchasers of different ages or genders would also be
25 valuable areas of study. At the same time, manufacturers and policy makers would benefit from a
26 better understanding of the efficacy of different methods of consumer training. In the interim, it
27 may be beneficial for manufacturers to draw from innovative approaches to technology training
28 by other successful tech companies. BMW appears to be exploring this model with their use of
29 their Genius Bar, but future research is required to determine if this method is effective in a
30 vehicle education setting.

31 Though some manufacturers are already placing a high priority on safety and consumer
32 education, others are not as focused and/or may be experiencing challenges successfully getting
33 dealerships to effectively engage with customers around these newer safety technologies.
34 Manufacturers frequently develop a range of consumer education material (on-line videos,
35 manuals, brochures, etc.) for use in the dealerships and other venues (marketing, etc.). While
36 many dealerships in the sample did use some materials developed by the manufacturers, there
37 was a lack of material use at other dealerships and the provision of inaccurate safety-critical
38 information. It seems that the employees at some dealers were either untrained, unfamiliar with
39 the available materials, or otherwise unwilling to engage a "customer" actively seeking
40 information. Given the relationship between manufacturers and dealerships, it is plausible that
41 methods could be developed to require or incentivize dealers to train employees or reward
42 employees who appropriately apply their training to consumer interactions.

43 If dealerships, the consumer-facing authority of the automotive ecosystem, do not place a
44 focus on introducing and educating every customer about the promise of key safety technologies,
45 the democratization of vehicle safety could suffer. Previous work has investigated the
46

1 availability of information on the efficacy of safety technologies in support of the development
2 of a theoretical rating system for vehicle technologies (16). Part of the project considered and
3 summarized information that is available to support consumer education. Since this time, efforts
4 such as My Car Does What (15) have further increased the on-line availability of generic
5 educational material. While information appears “everywhere”, the present study illustrates that
6 at the point of decision about vehicle purchase (i.e. at the dealer), the delivery system is often
7 fractured. Vehicle systems of years past were simple compared to the automation technologies of
8 today. Even modern automotive systems that are functionally the same differ in implementation
9 and capabilities between manufacturer. Yet while the manufacturers of these systems appear to
10 offer a range of on-line information, advertising campaigns, and other ways of introducing
11 consumers to this new era of safety, the vehicle sales and delivery system has not evolved
12 cohesively. Improvements in many areas of the vehicle sales, delivery, and post-delivery
13 ecosystems are needed to support a culture of safety.

14 Most vehicle sales occur at dealerships (19,20) and they are the only place in the current
15 automotive delivery system where there is a direct point of contact between the vehicle
16 manufacturer, the vehicle owner, and the organization charged with the sale, delivery, and post-
17 delivery responsibilities. As such, they are a logical and fundamentally essential point for
18 innovations in vehicle technology education. Typical vehicle maintenance provides a definite
19 point in time where follow-up education could be provided. Perhaps, if dealerships are able to
20 provide succinct and accurate introductions to key advanced safety technologies, this may
21 engage and encourage drivers to seek additional information on the use and benefits of these
22 systems.

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