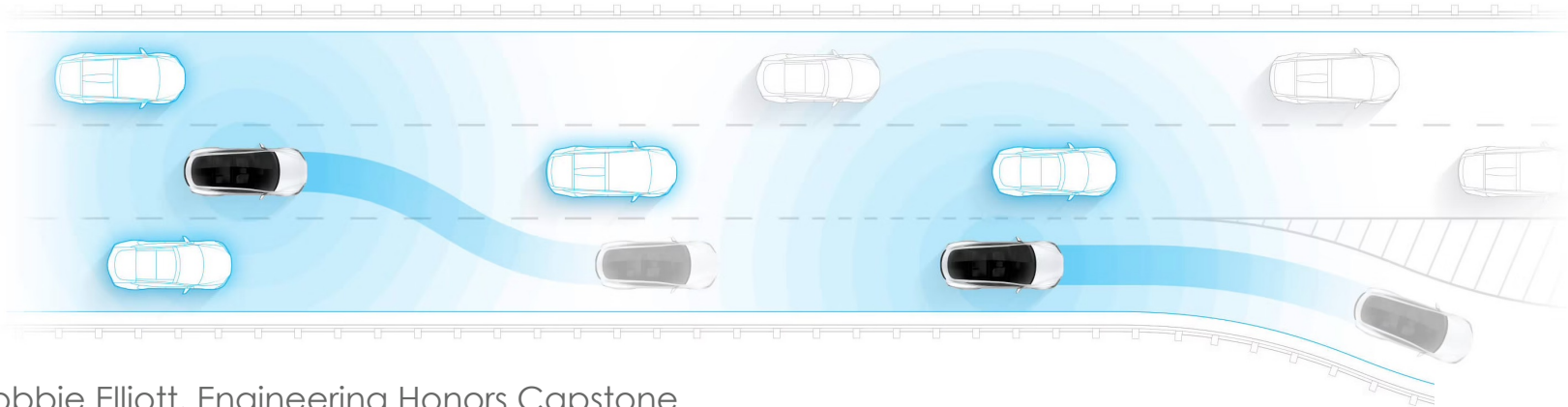


ENSURING THE  
**SAFETY OF ADVANCED DRIVER  
ASSISTANCE SYSTEMS (ADAS) IN  
AUTOMOBILES**

AS WE HEAD TOWARDS AN AUTONOMOUS FUTURE



Robbie Elliott, Engineering Honors Capstone  
December 9, 2021

# OVERVIEW

- **Background:**

- ✓ Problem
- ✓ Team
- ✓ Competing Values

- **Technology & Certification:**

- ✓ What is ADAS?
- ✓ Calibration
- ✓ Specification Methods

- **Current State:**

- ✓ Addressable Market
- ✓ Aftermarket Pricing
- ✓ Shop Survey
- ✓ Consumer Behavior

- **Value Creation Options:**

- ✓ Targets
- ✓ Target 1
- ✓ Target 2
- ✓ Target 3

- **Steps Forward**

- ✓ Recommendations



**BACKGROUND**

# BACKGROUND: PROBLEM

**The Automotive Aftermarket is struggling to service and safely return ADAS equipped vehicles to the road.**

Many shops can't afford the equipment to profitably perform services on these vehicles. Growth is expected to explode leading to *tremendous opportunity* for those that step forward...



# BACKGROUND: TEAM



Robbie Elliott  
University of Michigan, Senior  
Industrial & Operations Engineering

X



X



Jeff DeGraff  
Ross School of Business, Professor  
Dean of Innovation



# BACKGROUND: COMPETING VALUES

## Collaborate:

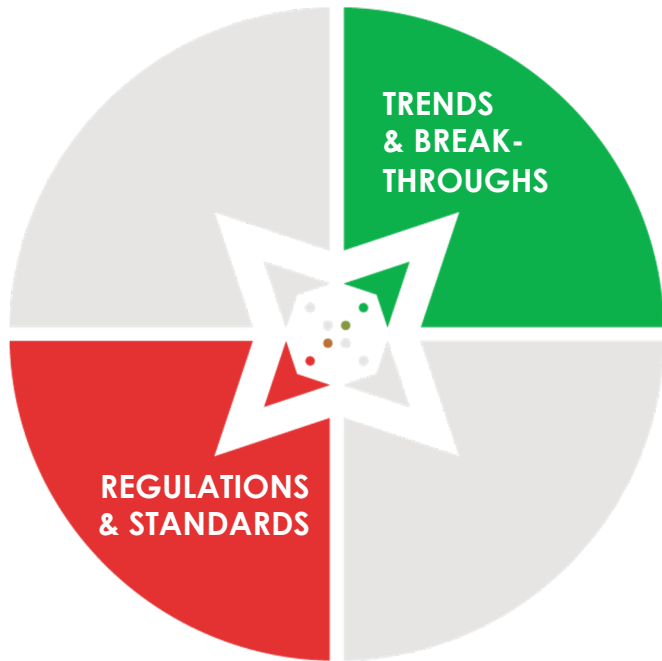
Discover what customers want and what your own people want

**Control:** Understand standards and regulations



**Create:** Identify trends and emerging technologies

**Compete:** Consider competitors and opportunities to make money



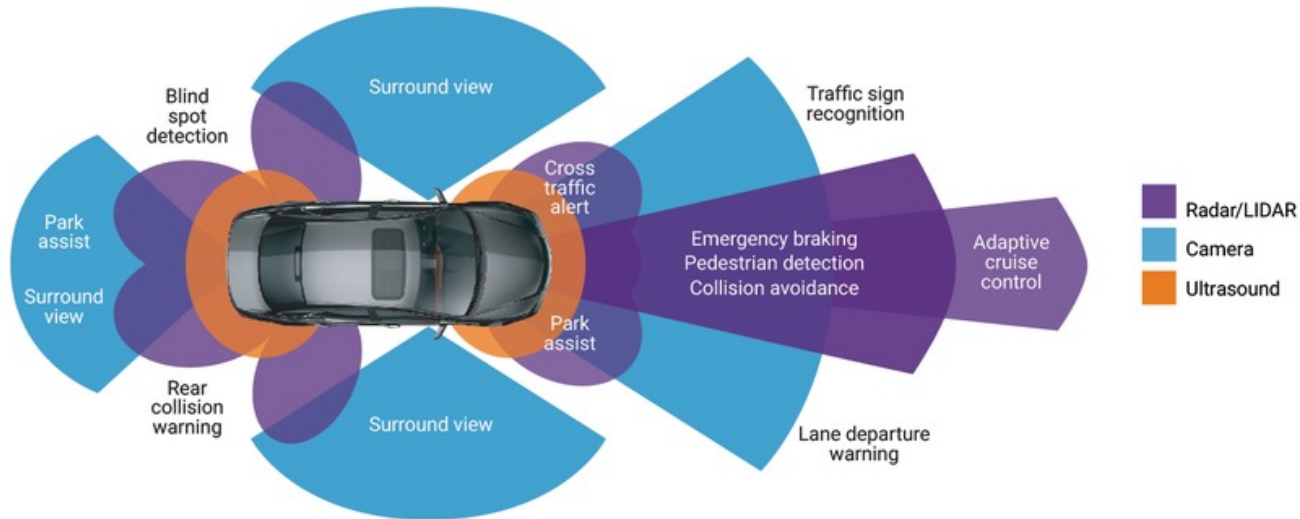
New value creation is borne from the creative conflict between opposite corners of the framework

# TECHNOLOGY & CERTIFICATION



# TECHNOLOGY: WHAT IS ADAS??

ADAS (Advanced Driver Assistance Systems) is a family of electronic technologies that enable automation of portions of vehicle operation. There are several functions that ADAS accomplishes, with safety being one of the primary focuses.



# TECHNOLOGY: CALIBRATION

Sensors must be recalibrated in the event of repair or replacement. These repairs can require large targets that take up significant area in a workshop, requiring 4-wheel alignment with targets fixed to the floor:



**CURRENT STATE**

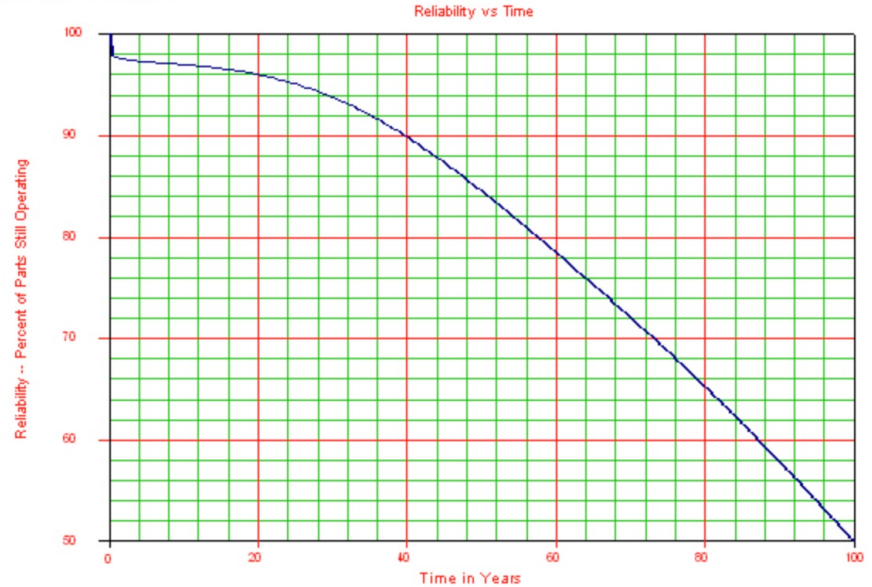
# CURRENT STATE: ADDRESSABLE MARKET

## Part Failure Rate Assumption:

Of the failures that occur in the first 20 years (about 4%), most failures occur in the first year. There could be a wear-out mode that comes into play before a hundred years has elapsed, but no wear-out distribution is considered.

Electronic components, unlike mechanical assemblies, rarely have wear-out mechanisms that are significant before many decades of operation.

PhotoStat by Weibull + G.D. - www.Weibull.com



Year	2030	2025	2020
Insured Vehicles	305,151,000	291,783,000	279,000,000
Claims per 100	6.07%	6.07%	6.07%
Crash Type			
Front	48%	48%	48%
Rear	30%	30%	30%
Side	21%	21%	21%
After Market Percentage	81%	81%	81%
Average Price			
Rear Camera	\$69	\$72	\$76
Rear Parking Sensors	\$80	\$85	\$89
Blind Spot Detection	\$292	\$308	\$324
Lane Departure Warning	\$297	\$313	\$329
Adaptive Cruise Control	\$363	\$382	\$402
AEB	\$363	\$382	\$402
<b>Part Life Failure Replacement</b>			
Part Failure per year	.53% per year	.53% per year	.53% per year
<b>Parts Failure TAM</b>	<b>\$ 501,468,739</b>	<b>\$ 307,679,280</b>	<b>\$ 51,995,960</b>
<b>Collision Replacement</b>			
Collision TAM w/o CR	\$ 908,788,455	\$ 577,056,943	\$ 297,580,099
<b>Collision w Crash Reduction</b>	<b>\$ 592,855,991</b>	<b>\$ 378,123,896</b>	<b>\$ 191,533,525</b>
<b>Total Addressable Market</b>			
Total TAM w/o CR	\$ 1,410,257,194	\$ 884,736,224	\$ 349,576,058
<b>TAM w Crash Reduction</b>	<b>\$ 1,094,324,730</b>	<b>\$ 685,803,176</b>	<b>\$ 243,529,485</b>

Total Addressable Market (TAM) was calculated by taking the vehicles in operation and determining number of ADAS equipped vehicles by year of age.

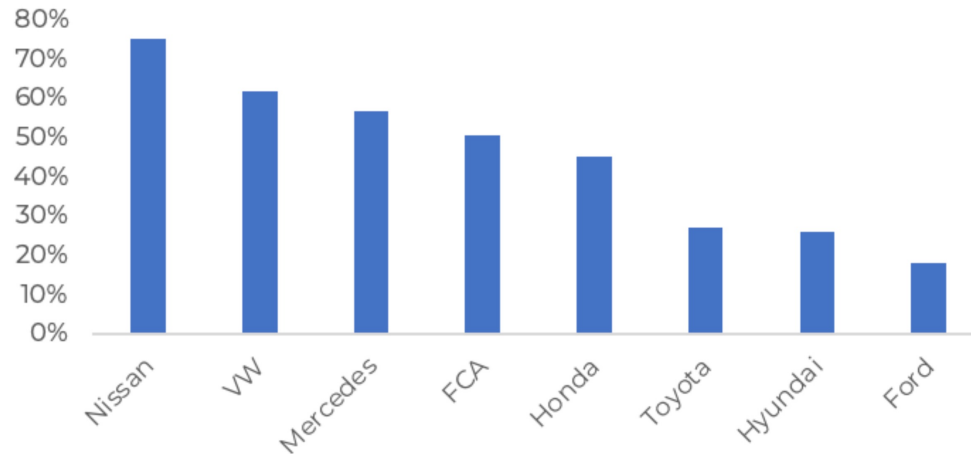
The total annual replacement rate is a conservative .53%. If ADAS components age more like Engine computers, the rate will be significantly higher.

Then, the Average cost of the ADAS system components repair for each of the ADAS type systems (Short range RADAR, Medium Range, Long Range, Cameras, etc.) was multiplied by the anticipated failure rate by year, based on the comparable component.

# CURRENT STATE: AFTERMARKET PRICING

Studied 8 OEM's and surveyed dozens of models, pricing both the OEM electronic component with Aftermarket products from Advanced Auto Parts & AutoZone:

Aftermarket Price Advantage of Electronic Parts



The chart shows a higher-than-expected variance by make for the acquisition of Aftermarket parts.

# CURRENT STATE: SHOP SURVEY

We surveyed over 450 independent aftermarket repair and collision shops throughout the United States and found that

**<15%** of aftermarket shops service ADAS

## Reason #1:

“Too expensive to acquire necessary hardware and software”

- **Franks Auto Reconditioning**

## Reason #2:

“We are not at that point yet, but we are preparing for it because we know it's coming on all of the newer cars”

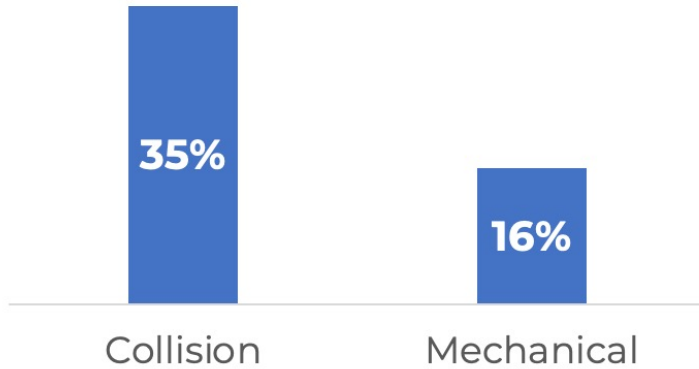
- **Davis Auto Care**

## Reason #3:

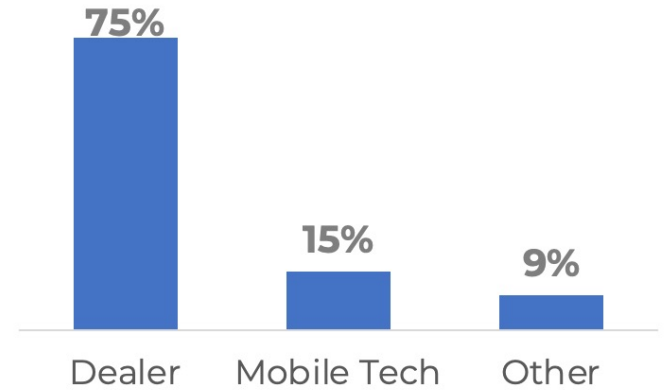
“We just don't see those types of cars yet”

- **Affordable Automotive**

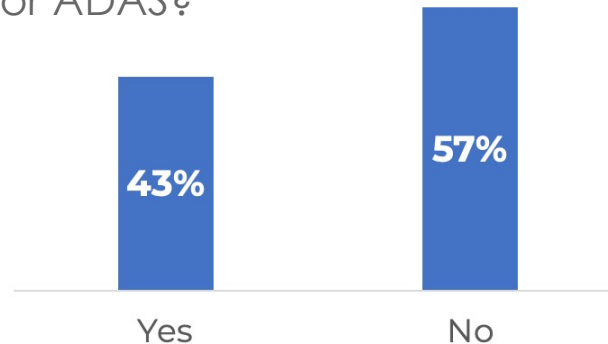
Do you service ADAS?



Where do you send vehicles that require ADAS Services?



Do you have a dedicated bay for ADAS?

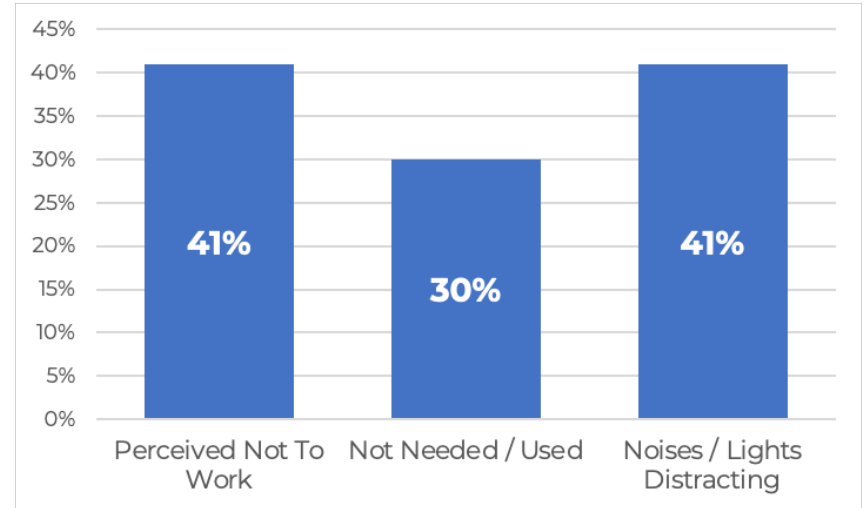




# CURRENT STATE: CONSUMER BEHAVIOR

- ✓ 45% of ADAS systems have been deactivated by the consumer
- ✓ 24% of ADAS equipped vehicles are driven in a less safe manner (IIHS study)
- ✓ ADAS equipped vehicles exhibit a higher total loss ratio in a collision versus non-equipped vehicles

Consumer rationale for ADAS deactivation





# VALUE CREATION OPTIONS

# VALUE CREATION OPTIONS: TARGETS

## Target 1: Cost of ADAS Repairs

- ✓ Part & equipment costs out of reach for most shops



## Target 2: Shop Competency in ADAS Service

- ✓ Requires high skillset and not enough volume for in-house service



## Target 3: Consumer Usage of ADAS

- ✓ Systems are deactivated & drivers drive less safe



# VALUE CREATION OPTIONS: TARGET 1

## Target 1: Cost of ADAS Repairs

**ECONOMY &  
COMPETITORS**

**SPEED & SHORT-  
TERM FOCUS**

Partnering with an experienced certification firm offers speed and risk mitigation, however, there are no clear precedents to offer confidence in a path forward.

Experimentation is critical prior to incorporation as a core strategic initiative as is the presence of a supportive regulatory framework.

**-- Partnerships offer speed to market --**

# VALUE CREATION OPTIONS: TARGET 1

## Target 1: Cost of ADAS Repairs

Open collaborative models for certification has potential merit as the lowest risk option but face the question of demand in the mechanical channel - which is uncertain given the National Sanitary Foundation (NSF) experience in the collision space.

**COLLABORATION  
& SUSTAINABILITY**

-- Collaborative approaches offer sustained benefit --

**CUSTOMERS &  
COMMUNITY**

# VALUE CREATION OPTIONS: TARGET 2

## Target 2: Shop Competency in ADAS Service

There is a market need for targeted certification training on ADAS technologies, and an opportunity to rethink how training is delivered to the working technician.

An out of the box thought at value creation that utilizes new technology in a new space and forges new dimensions of a relationship with shops.

-- Technology as leverage for the  
aftermarket --

**CREATIVE &  
NOVEL**

**TECHNOLOGY  
& TRENDS**

# VALUE CREATION OPTIONS: TARGET 3

## Target 3: Consumer Usage of ADAS

The least risk, most complete way to accomplish certification adoption and resulting safety is through regulation. This path will take a significant amount of time and require years of effort to accomplish.

The aftermarket repairer and customer will likely only adopt certified repair parts and calibration if the repair must meet regulated levels of quality.

**-- Safety often requires a “control” approach --**

**CONTROL &  
CORRECTNESS**

**REGULATIONS  
& STANDARDS**

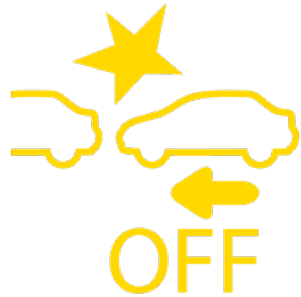
**STEPS FORWARD**



# STEPS FORWARD: RECOMMENDATIONS

## Recommendation 1: Pursuit of Regulatory Framework

- ✓ Systems remain operational & not deactivated



## Recommendation 2: Protect Vehicles via Inspections

- ✓ Mandate that systems actually have to work after being installed



## Recommendation 3: Certify Technicians to Service ADAS

- ✓ Inspections will drive people to rely on aftermarket shops



THANKS & GO BLUE!!



**ENGINEERING  
HONORS PROGRAM**  
UNIVERSITY OF MICHIGAN

